

TENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 48947	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/FI 99/00925	International filing date (<i>day/month/year</i>) 5 November 1999	(Earliest) Priority Date (<i>day/month/year</i>) 6 November 1998
Applicant Nokia Networks OY et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ transcribed by this Authority.
4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - ☒ the text is approved as submitted by the applicant.
 - ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
Figure No. 2 ☒ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP 0954187 A1 (NOKIA MOBILE PHONES LTD.), 3 November 1999 (03.11.99), column 4, line 24 - line 37; column 5, line 27 - line 57, abstract --	1,16
P,A	WO 9939528 A1 (NOKIA TELECOMMUNICATIONS OY), 5 August 1999 (05.08.99), abstract --	1,16
E,A	EP 0981229 A2 (LG ELECTRONICS INC.), 23 February 2000 (23.02.00), abstract --	1,16

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 April 2000

Date of mailing of the international search report

24.05.2000

Name and mailing address of the International Searching Authority
European Patent Office P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel(+31-70)340-2040, Tx 31 651 epo nl,
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Authorized officer

Jaana Raivio/cs
Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00925

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 9952307 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 14 October 1999 (14.10.99), page 4, line 6 - page 6, line 4 --	1,16
P,A	WO 9949684 A2 (SIEMENS AKTIENGESELLSCHAFT), 30 Sept 1999 (30.09.99), abstract --	1,16
A	EP 0836291 A2 (NORTHERN TELECOM LIMITED), 15 April 1998 (15.04.98), abstract -----	1,16

SA 257308

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 99/00925

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0954187	A1	03/11/99	FI	980923 D	00/00/00
				WO	9956437 A	04/11/99
WO	9939528	A1	05/08/99	FI	3556 U	31/08/98
				FI	980208 D,V	27/04/98
EP	0981229	A2	23/02/00	NONE		
WO	9952307	A1	14/10/99	US	5923592 A	13/07/99
WO	9949684	A2	30/09/99	NONE		
EP	0836291	A2	15/04/98	GB	9621333 D	00/00/00
				JP	10136441 A	22/05/98

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BERGGREN OY AB
P.O. Box 16
00101 Helsinki
FINLANDE

Berggren Oy Ab

15-08-2000

12/11

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing
(day/month/year)

11.08.2000

11.11.00 *gas*

Applicant's or agent's file reference

48947/ML/MM

REPLY DUE

within 3 month(s)
from the above date of mailing

International application No.

PCT/FI99/00925

International filing date (day/month/year)

05/11/1999

Priority date (day/month/year)

06/11/1998

International Patent Classification (IPC) or both national classification and IPC

H04Q7/38

Applicant

NOKIA NETWORKS OY et al.

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain document cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **06/03/2001**.

Name and mailing address of the international preliminary examining authority:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

von der Straten, G

Formalities officer (incl. extension of time limits)

Finnie, A

Telephone No. +49 89 2399 8251



I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*):

Description, pages:

1-17 as originally filed

Claims, No.:

1-21 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims
Inventive step (IS)	Claims 1-21
Industrial applicability (IA)	Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/FI99/00925

1. Reference is made to the following documents:

D1 = SCHIEDER A. ET AL: "GRAN - A new Concept for Wireless Access in UMTS", ISS '97 INTERNATIONAL SWITCHING SYMPOSIUM, TORONTO , 21. September 1997-26. September 1997, vol. 2, no. , pages 339 to 345

D2 = US, A, 5 644 715

Copies of the documents are attached to this communication.

2. **Concerning item VIII**

The application does not meet the requirements of Article 6 PCT because independent **claims 1 and 16** are not clear for the following reasons:

- a. According to the description, page 2, lines 9 - 18, the object of the alleged invention is to control the total bitrate of all bearers of a user and to reduce the amount of data transmission needed for communicating the bit rates of bearers from a transmitting entity to a receiving entity. OK.

However present **claim 1** does not specify all the features required for achieving this object: At least the following additional technical features are required for the definition of the alleged invention to achieve the object mentioned in the description:

- definition of the term "bearer" in the sense of the description, page 1, lines 20 - 23;
 - the feature that a transmitting and receiving entity are involved in controlling the bearer;
 - the way in which "allowed transport format combinations" are constructed from the information.
- has better
old man,
agelung...

Furthermore, the steps of the method of **claim 1** should be in a logical order: At present it is unclear why the step of construction of transport format combinations precedes the step of communicating information for construction of said set to the

receiver.

- b. The above objection with respect to insufficient definition of the alleged invention equally applies to the corresponding independent apparatus **claim 16**.

Moreover, **claim 16** is unclear with respect to the structure of the system claimed:

The claimed system obviously comprises two means (means for construction, means for communication) which are not related or connected in any respect, and, therefore, the system according to claim 16 is defined by a mere aggregation of unrelated features.

Claim 16 should clearly define the system by specifying all the features necessary for the definition of the alleged invention and claim 16 should also specify the interaction of the features.

3. **Concerning item V**

- a. Even if **claims 1 and 16** were clarified in the sense of point 2 above it seems that claims 1 and 16 would not involve an inventive step for the following reasons:
- b. Document D1, see in particular pages 342 and 343, which is considered to represent the state of the art with respect to **claim 1**, discloses according to essential feature of claim 1, a method for controlling bearer in a cellular telecommunication system (page 342, left column, chapter 3.1: bearer negotiation functionality).

The method of D1 is already characterized by the step of constructing a set of transport format combinations (page 342, left column, chapter 3.1 and page 343, left column, lines 1 - 13: QoS parameters comprising peak bit rate, etc).

Document D1 differs from that of claim 1 in that D1 does not explicitly disclose that information for construction of said set is communicated to a receiver.

However, in order to establish a bearer between a receiver and a transmitter, the same information for construction of that bearer have to be available at both the

receiver and the transmitter end of the bearer connection.

Therefore, the skilled person would transmit this information to the receiver in order to allow for instance for a check whether an incoming bearer connection can be supported by the receiver.

Therefore, **claim 1** lacks an inventive step, Article 33 (3) PCT.

- c. The system of **claim 16** corresponds to the method of claim 1 and once the principle of the method of claim 1 is available to the skilled person as demonstrated above with regard to D1 and common general knowledge, the structural details defined by **claim 16** for implementing the method of claim 1 are also considered as falling within the normal design capability of a skilled person and cannot offer a basis for an inventive claim.
- d. For the sake of completeness, the attention of the Applicant is drawn to document D2, see in particular, column 4, line 58 to column 5, line 67, column 6, lines 25 - 50 and figures 3 and 5. D2 discloses a method and system for the construction of an allowable set of transport format combinations (column 5, lines 24 - 30: QoS Parameters) which are transmitted to the receiver. This transport format combinations are used for the same purpose which is disclosed in the description, ie. the selection of appropriate bearer connection parameters. Therefore, the Applicant should also consider the disclosure of D2 when redrafting the independent claims.
- e. The additional features introduced by dependent **claims 2 - 15 and 16 - 21** refer only to minor implementing details which are known or directly derivable from the cited prior art references D1 and D2, see below, or fall within the general knowledge of a person skilled in the art.

Therefore, dependent **claims 2 - 15 and 16 - 21** are not allowable due to lack of inventive step, Article 33 (3) PCT.

4. Concerning item VII

The independent claims should be drafted in the proper two-part "characterised" form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, presumably that represented by the above noted **D1**.

If any amended independent claims are filed, the opening part of the description should be brought into agreement with the wording thereof.

In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art, i.e. the documents D1 and D2 noted above, should be acknowledged by reference and briefly discussed in the introductory part of the description.

All the claims should include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.

The general "spirit and scope" statement in the description at page **17, lines 20 - 21** is unclear, and when used to interpret the claims renders them also unclear, contrary to Article 6 PCT. The statement should therefore be deleted.

The attention of the Applicant is finally drawn to the fact that the application should include independent claims comprising all the essential technical features of the invention (Rule 6.4(a)-(c) PCT) and may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as originally filed (Articles 19 (2) and 34 (2) b PCT).



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ :

H04Q 7/38

A3

(11) International Publication Number:

WO 00/28760

(43) International Publication Date:

18 May 2000 (18.05.00)

(21) International Application Number: PCT/FI99/00925

(22) International Filing Date: 5 November 1999 (05.11.99)

(30) Priority Data:

982417

6 November 1998 (06.11.98)

FI

(71) Applicant (for all designated States except US): NOKIA NETWORKS OY [FI/FI]; P.O. Box 300, FIN-00045 Nokia Group (FI).

(72) Inventors; and

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(74) Agent: BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

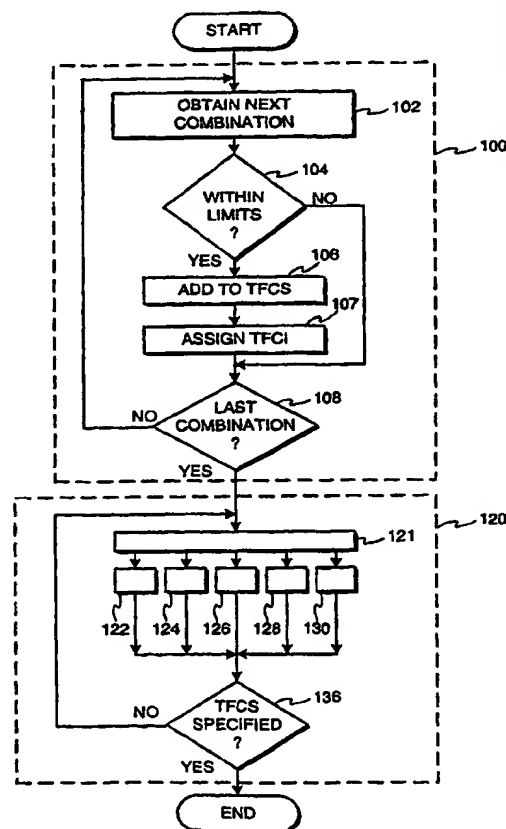
(88) Date of publication of the international search report:

3 August 2000 (03.08.00)

(54) Title: METHOD FOR CONTROLLING BEARER PROPERTIES

(57) Abstract

The invention concerns the control of connections in cellular telecommunication systems. According to the invention, the available radio resources are controlled by allowing only certain combinations of transport formats to be used by a single user. The inventive method restricts the combinations of bearer bit rates which can be used, without strictly limiting some bearers from using highest bit rates. This inventive approach allows flexible overall control of radio resources, while retaining the possibility of bearers to select between different bit rates.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

AMENDMENTS TO CLAIMS

1. Method for controlling a plurality [number] of bearers, said bearers being data transmission paths relating to a receiver and each bearer having at least one transport format (TF) describing properties of said bearer, in a cellular telecommunication system, characterized in that the method comprises steps, in which

- a set of allowed transport format combinations (TFCS) is constructed [(100)], a transport format combination (TFC) being a combination of transport formats (TF) of a plurality [number] of bearers, and

- information [, which is different from information explicitly] specifying [for each allowed transport format combination (TFC) the transport format (TF) for each bearer and which implicitly specifies] said set of allowed transport format combinations (TFCS) [,] is communicated [(120)] to the receiver [so that said information, together with predefined information possessed by the receiver, enables the receiver to construct] for construction of said set of allowed transport format combinations (TFCS) at the receiver.

16. System for controlling a plurality of bearers in a cellular telecommunication system, said bearers being data transmission paths relating to a mobile communication means and each bearer having at least one transport format (TF) describing properties of said bearer, characterized in that the system comprises

- means for constructing a set of allowed transport format combinations (TFCS), a transport format combination (TFC) being a combination of transport formats (TF) of a [number] plurality of bearers, in a network element of the cellular telecommunication system, and

- means for communicating information [, which is different from information explicitly] specifying [for each allowed transport format combination (TFC) the transport format (TF) for each bearer and which implicitly specifies] said set of allowed transport format combinations (TFCS) [,] to the mobile communication means [so that said information, together with predefined information possessed by the mobile communication means, enables the mobile communication means to construct] for constructing said set of allowed transport format combinations (TFCS) at the mobile communication means.

TRAITE D'COOPERATION EN MATIERE DE BREVETS

PCT

NOTIFICATION DE L'ENREGISTREMENT D'UN CHANGEMENT

(règle 92bis.1 et
instruction administrative 422 du PCT)

Expéditeur: le BUREAU INTERNATIONAL

Destinataire:

ECREPONT, Robert
Société Civile Cabinet Ecrepont
27bis rue du Vieux Faubourg
F-59800 Lille
FRANCE

Date d'expédition (jour/mois/année) 12 janvier 2001 (12.01.01)	
Référence du dossier du déposant ou du mandataire P 121 312 INT	NOTIFICATION IMPORTANTE
Demande internationale no PCT/FR99/00925	Date du dépôt international (jour/mois/année) 20 avril 1999 (20.04.99)

1. Les renseignements suivants étaient enregistrés en ce qui concerne:

☐ le déposant
 ☐ l'inventeur
 ☒ le mandataire
 ☐ le représentant commun

Nom et adresse

ECREPONT, Robert
Cabinet Ecrepont
12, place Simon Vollant
F-59800 LILLE
FRANCE

Nationalité (nom de l'Etat)

Domicile (nom de l'Etat)

no de téléphone

03.20.52.32.26

no de télécopieur

03.20.88.08.04

no de téléimprimeur

2. Le Bureau international notifie au déposant que le changement indiqué ci-après a été enregistré en ce qui concerne:

☐ la personne
 ☐ le nom
 ☒ l'adresse
 ☐ la nationalité
 ☐ le domicile

Nom et adresse

ECREPONT, Robert
Société Civile Cabinet Ecrepont
27bis rue du Vieux Faubourg
F-59800 Lille
FRANCE

Nationalité (nom de l'Etat)

Domicile (nom de l'Etat)

no de téléphone

03 20 63 28 88

no de télécopieur

03 20 63 28 90

no de téléimprimeur

3. Observations complémentaires, le cas échéant:

4. Une copie de cette notification a été envoyée:

☒ à l'office récepteur
 ☐ aux offices désignés concernés
☐ à l'administration chargée de la recherche internationale
 ☒ aux offices élus concernés
☒ à l'administration chargée de l'examen préliminaire international
 ☐ autre destinataire:

Bureau international de l'OMPI
 34, chemin des Colombettes
 1211 Genève 20, Suisse

Fonctionnaire autorisé:

Sean Taylor

no de télécopieur (41-22) 740.14.35

no de téléphone (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 29 June 2000 (29.06.00)	
International application No. PCT/FI99/00925	Applicant's or agent's file reference 48947
International filing date (day/month/year) 05 November 1999 (05.11.99)	Priority date (day/month/year) 06 November 1998 (06.11.98)
Applicant SALONEN, Janne et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

29 May 2000 (29.05.00)

☐ in a notice effecting later election filed with the International Bureau on:
2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Manu Berrod Telephone No.: (41-22) 338.83.38
--	--

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference 48947/ML/MM	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00925	International filing date (day/month/year) 05/11/1999	Priority date (day/month/year) 06/11/1998
International Patent Classification (IPC) or national classification and IPC H04Q7/38		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 29/05/2000	Date of completion of this report 08.02.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer von der Straten, G Telephone No. +49 89 2399 8994 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00925

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

Description, pages:

1-17 as originally filed

Claims, No.:

1-21 as received on 16/11/2000 with letter of 13/11/2000

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI99/00925

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-21
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-21
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-21
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

1. Reference is made to the following documents:

D1 = SCHIEDER A. ET AL: "GRAN - A new Concept for Wireless Access in UMTS", ISS '97 INTERNATIONAL SWITCHING SYMPOSIUM, TORONTO , 21. September 1997-26. September 1997, vol. 2, no. , pages 339 to 345

D2 = US, A, 5644715

2. **Concerning item V**

- a. The application as per the preamble of **claim 1** relates to a method for controlling bearers each bearer having at least one transport format. Methods for controlling bearers are known in the art and in particular from document **D1**, which forms the closest prior art.

Document **D1**, discloses, in accordance with the features of the preamble of **claim 1**, a method for controlling a bearer in a mobile communication environment. The parameters of the bearer, in particular traffic parameters as, for instance, the data rate and quality of service parameters as, for instance, the bit error rate, are negotiated between transmitter and receiver at call set up.

Document D2 discloses a method of establishing multi-media conference calls between a plurality of computers. The quality of service parameter for each computer are collected and stored. At the time of the conference call the connections are established according to the stored parameters.

The method of **claim 1** differs from that of D1 in that a number of bearers is controlled. According to the characterizing portion of claim 1 a set of allowed transport format combinations is constructed from transport formats of a number of bearers. Information relating to this transport format combination is transmitted to the receiver in such a way that the receiver is enabled to construct the set of transport format combinations.

This claimed method of constructing and transmitting transport format combinations of bearers is neither taught, nor rendered obvious, alone or in

combination, by documents D1 and D2, the prior art documents acknowledged in the description or cited in the International Search Report.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT. The subject-matter of claim 1 is also industrially applicable.

- b. The same applies to independent **claim 16**, which is directed to a system based on the same concepts. Claim 16, therefore, equally meets the requirements of Article 33(1) PCT.
- c. Dependent **claims 2 - 15 and 17 - 21** relate to further implementing details of the method and apparatus defined by the independent claims to which they refer and are therefore equally novel, inventive and industrially applicable.

3. **Concerning item VII**

The relevant prior art, i.e. the documents D1 and D2 noted above, should have been acknowledged by reference and briefly discussed in the introductory part of the description, Rule 5.1.(a),(ii) PCT.

All the claims should include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.

The general "spirit and scope" statement in the description at page 17, lines 20 - 21 is unclear, and when used to interpret the claims renders them also unclear, contrary to Article 6 PCT. The statement should therefore have been deleted.

Claims

1. Method for controlling a number of bearers, said bearers being data transmission paths relating to a receiver and each bearer having at least one transport format (TF) describing properties of said bearer, in a cellular telecommunication system,
5 **characterized** in that the method comprises steps, in which
- a set of allowed transport format combinations (TFCS) is constructed (100), a transport format combination (TFC) being a combination of transport formats (TF) of a number of bearers, and
 - 10 - information, which is different from information explicitly specifying for each allowed transport format combination (TFC) the transport format (TF) for each bearer and which implicitly specifies said set of allowed transport format combinations (TFCS), is communicated (120) to the receiver so that said information, together with predefined information possessed by the receiver, enables
15 the receiver to construct said set of allowed transport format combinations (TFCS).
2. A method according to claim 1, **characterized** in that said set of allowed transport format combinations is constructed by checking for each transport format combination, whether the combination is within predefined
20 limits.
3. A method according to claim 1, **characterized** in that a transport format combination identifier is assigned to each combination of said set of allowed transport format combinations.
25
4. A method according to claim 3, **characterized** in that said assigning of transport format combination identifiers is performed according to a predefined rule.
- 30 5. A method according to claim 4, **characterized** in that said set of allowed transport format combinations is ordered according to at least the total bit rate of the transport format combinations, and said transport format combination identifiers are assigned so that the identifiers form a sequence of consecutive integer numbers.
- 35 6. A method according to claim 1, **characterized** in that

said step of communicating information for construction of said set comprises the step of communicating of each allowed transport format combination to said receiver.

- 5 7. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating of each non-allowed transport format combination to said receiver.
- 10 8. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating at least one limit for construction of said set to said receiver.
- 15 9. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination.
- 20 10. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of specifying the differences between said set to a previous set of transport format combinations.
- 25 11. A method according to claim 1, **characterized** in that a bearer request is admitted, if at least one of the transport formats of the requested bearer is a part of an allowed transport format combination.
- 30 12. A method according to claim 3, **characterized** in that transport formats used in a transmission between a receiver and a transmitter are identified by sending a transport format combination identifier from the transmitter to the receiver.
- 35 13. A method according to claim 3, **characterized** in that if either party of the connection detects that the transport format combination identifiers of the receiver do not correspond to the transport format combination identifiers of the transmitter, the transport format combination identifiers are reconstructed at at least one party of the connection.

14. A method according to claim 13, **characterized** in that
said step of reconstruction comprises the reconstruction of transport format
combination identifiers at both parties of the connection according to a predefined
5 rule.

15. A method according to claim 13, **characterized** in that
in said step of reconstruction, one of the parties of the connection communicates its
transport format combination identifiers to the other party, which takes the
10 communicated identifiers into use.

16. System for controlling bearers in a cellular telecommunication system, said
bearers being data transmission paths relating to a mobile communication means
and each bearer having at least one transport format (TF) describing properties of
15 said bearer, **characterized** in that the system comprises
- means for constructing a set of allowed transport format combinations (TFCS), a
transport format combination (TFC) being a combination of transport formats (TF)
of a number of bearers, in a network element of the cellular telecommunication
system, and
20 - means for communicating information, which is different from information
explicitly specifying for each allowed transport format combination (TFC) the
transport format (TF) for each bearer and which implicitly specifies said set of
allowed transport format combinations (TFCS), to the mobile communication means
so that said information, together with predefined information possessed by the
25 mobile communication means, enables the mobile communication means to
construct said set of allowed transport format combinations (TFCS).

17. A system according to claim 16, **characterized** in that
said means for constructing a set of allowed transport format combinations
30 comprises
- a memory element for storing a set of allowed transport format combinations,
- means for checking whether a single transport format combination is within
predetermined limits, and
- means for adding a single transport format combination to said set of allowed
35 transport format combinations stored in said memory element.

18. A system according to claim 16, **characterized** in that

said means for communicating a constructed set of allowed transport format combinations to a mobile communication means comprises means for determining non-allowed transport format combinations.

- 5 19. A system according to claim 16, **characterized** in that the system further comprises means for storing a previously constructed second set of allowed transport format combinations,
and said means for communicating a constructed set of allowed transport format combinations to a mobile communication means comprises
10 means for searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations.
- 15 20. A system according to claim 16, **characterized** in that the system further comprises means for assigning a transport format combination identifier to each transport format combination stored in said memory element.
21. A system according to claim 16, **characterized** in that the system further comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission.

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Berggren Oy Ab

28-05-2000

mm / ML

Date of mailing (day/month/year)

18 May 2000 (18.05.00)

Applicant's or agent's file reference

48947

IMPORTANT NOTICE

International application No.

PCT/FI99/00925

International filing date (day/month/year)

05 November 1999 (05.11.99)

Priority date (day/month/year)

06 November 1998 (06.11.98)

Applicant

NOKIA NETWORKS OY et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AU,CN,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,
GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,
PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 18 May 2000 (18.05.00) under No. WO 00/28760

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

J. Zahra

Telephone No. (41-22) 338.83.38

The demand must be filed directly with the competent International Preliminary Examining Authority. If two or more Authorities are competent, with the one chosen by the applicant. The name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND
------------------------	---------------------------

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 48947/ML/MM
International application No. PCT/FI99/00925	International filing date. (day/month/year) 5 November 1999 (05.11.99)	(Earliest) Priority date (day/month/year) 6 November 1998 (06.11.98)
Title of invention METHOD FOR CONTROLLING BEARER PROPERTIES		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) NOKIA NETWORKS OY P.O. Box 300 FIN-00045 Nokia Group Finland		Telephone No.:
		Facsimile No.:
		Teleprinter No.:
State (that is, country) of nationality: Finland		State (that is, country) of residence: Finland
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) SALONEN, Janne Rantakoskelantie 3 A 2 FIN-90570 OULU Finland		
State (that is, country) of nationality: Finland		State (that is, country) of residence: Finland
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) RINNE, Mikko Tallbergin puistotie 1 C 25 FIN-00200 HELSINKI Finland		
State (that is, country) of nationality: Finland		State (that is, country) of residence: Finland
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

HONKASALO, Harri
Haravakuja 12
FIN-01660 VANTAA
Finland

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

RAJANIEMI, Jaakko
Lapinrinne 2 A 11
FIN-00180 HELSINKI
Finland

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

AHMAVAARA, Kalle
Ruostekuja 3 D 24
FIN-01610 VANTAA
Finland

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

State (that is, country) of nationality:

State (that is, country) of residence:

☐ Further applicants are indicated on another continuation sheet.

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation.
The address must include postal code and name of country.)*BERGGREN OY AB
P.O.Box 16
FIN-00101 HELSINKI
Finland

Telephone No.:

+358 9 693 701

Facsimile No.:

+358 9 693 3944

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments: ***

1. The applicant wishes the international preliminary examination to start on the basis of:

☐ the international application as originally filed

the description

☐ as originally filed☐ as amended under Article 34

the claims

☐ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34

the drawings

☐ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☒ which is the language of a translation furnished for the purposes of international search.☒ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (<i>specify</i>) | : | sheets |

For International Preliminary Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

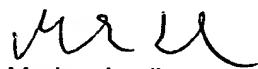
The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (<i>specify</i>): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

BERGGREN OY AB



Markus Levlin
Patent Agent

29 May 2000

For International Preliminary Examining Authority use only

- | | |
|--|---|
| 1. Date of actual receipt of DEMAND: | |
| 2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b): | |
| 3. <input type="checkbox"/> The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. | <input type="checkbox"/> The applicant has been informed accordingly. |
| 4. <input type="checkbox"/> The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5. | |
| 5. <input type="checkbox"/> Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82. | |

For International Bureau use only

Demand received from IPEA on:

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No. PCT/FI99/00925	For International Preliminary Examining Authority use only	
Applicant's or agent's file reference 48947/ML/MM	Date stamp of the IPEA	
Applicant NOKIA NETWORKS OY		
Calculation of prescribed fees		
1. Preliminary examination fee	EUR 1533	<input type="checkbox"/> P
2. Handling fee <i>(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)</i>	EUR 147	<input type="checkbox"/> H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	EUR 1680	
TOTAL		
Mode of Payment		
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	
<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps	
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons	
<input checked="" type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):	
Deposit Account Authorization <i>(this mode of payment may not be available at all IPEAs)</i>		
The IPEA/ _____ <input type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account.		
<input type="checkbox"/> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
Deposit Account Number _____	Date (day/month/year) _____	Signature _____

PCT REQUEST

48947

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0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4 0-4-1	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.84 (updated 01.07.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	48947
I	Title of invention	METHOD FOR CONTROLLING BEARER PROPERTIES
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	NOKIA NETWORKS OY
II-5	Address:	P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	SALONEN, Janne
III-1-5	Address:	Rantakoskelantie 3 A 2 FIN-90570 Oulu Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

48947

Original (for SUBMISSION) - printed on 05.11.1999 01:55:47 PM

III-2	Applicant and/or inventor	
III-2-1	This person is:	applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	RINNE, Mikko
III-2-5	Address:	Tallbergin puistotie 1 C 25 FIN-00200 Helsinki Finland
III-2-6	State of nationality	FI
III-2-7	State of residence	FI
III-3	Applicant and/or inventor	
III-3-1	This person is:	applicant and inventor
III-3-2	Applicant for	US only
III-3-4	Name (LAST, First)	HONKASALO, Harri
III-3-5	Address:	Haravakuja 12 FIN-01660 Vantaa Finland
III-3-6	State of nationality	FI
III-3-7	State of residence	FI
III-4	Applicant and/or inventor	
III-4-1	This person is:	applicant and inventor
III-4-2	Applicant for	US only
III-4-4	Name (LAST, First)	RAJANIEMI, Jaakko
III-4-5	Address:	Lapinrinne 2 A 11 FIN-00180 Helsinki Finland
III-4-6	State of nationality	FI
III-4-7	State of residence	FI
III-5	Applicant and/or inventor	
III-5-1	This person is:	applicant and inventor
III-5-2	Applicant for	US only
III-5-4	Name (LAST, First)	AHMAVAARA, Kalle
III-5-5	Address:	Ruostekuja 3 D 24 FIN-01610 Vantaa Finland
III-5-6	State of nationality	FI
III-5-7	State of residence	FI
IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
IV-1-2	Address:	P.O. Box 16 FIN-00101 Helsinki Finland
IV-1-3	Telephone No.	+358-9-693701
IV-1-4	Facsimile No.	+358-9-6933944
IV-1-5	e-mail	email.box@berggren.elisa.fi

PCT REQUEST

48947

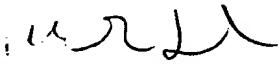
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V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AP: GH GM KE LS MW SD SL SZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT</p> <p>EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT</p> <p>EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT</p> <p>OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT</p>
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AE AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW</p>
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date	06 November 1998 (06.11.1998)
VI-1-2	Number	982417
VI-1-3	Country	FI
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1

PCT REQUEST

48947

Original (for SUBMISSION) - printed on 05.11.1999 01:55:47 PM

VII-1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	17	-
VIII-3	Claims	4	-
VIII-4	Abstract	1	48947.txt
VIII-5	Drawings	3	-
VIII-7	TOTAL	29	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	English	
IX-1	Signature of applicant or agent		
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Markus Levlin	
IX-1-3	Capacity	Patent Agent	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	

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11-1	Date of receipt of the record copy by the International Bureau	
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PCT (ANNEX - FEE CALCULATION SHEET)

48947

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(This sheet is not part of and does not count as a sheet of the international application)

0	For receiving Office use only		
0-1	International Application No.		
0-2	Date stamp of the receiving Office		
0-4	Form - PCT/RO/101 (Annex) PCT Fee Calculation Sheet		
0-4-1	Prepared using	PCT-EASY Version 2.84 (updated 01.07.1999)	
0-9	Applicant's or agent's file reference	48947	
2	Applicant	NOKIA NETWORKS OY, et al.	
12	Calculation of prescribed fees	fee amount/multiplier	total amounts (FIM)
12-1	Transmittal fee T	⇒	800
12-2	Search fee S	⇒	5 618,7
12-3	International fee Basic fee (first 30 sheets) b1	2 455,6	
12-4	Remaining sheets	0	
12-5	Additional amount (X)	59,5	
12-6	Total additional amount b2	0	
12-7	b1 + b2 = B	2 455,6	
12-8	Designation fees Number of designations contained in international application	82	
12-9	Number of designation fees payable (maximum 10)	10	
12-10	Amount of designation fee (X)	564,8	
12-11	Total designation fees D	5 648	
12-12	PCT-EASY fee reduction R	-755,1	
12-13	Total International fee (B+D-R) I	⇒	7 348,5
12-14	Fee for priority document Number of priority documents requested	1	
12-15	Fee per document (X)	422	
12-16	Total priority document fee P	⇒	422
12-17	TOTAL FEES PAYABLE (T+S+I+P)	⇒	14 189,2
12-19	Mode of payment	cheque	

VALIDATION LOG AND REMARKS

13-2-3	Validation messages Names	Green? Applicant 1.:Telephone No. missing
		Green? Applicant 1.:Facsimile No. missing

PCT (ANNEX - FEE CALCULATION SHEET)

48947

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13-2-6	Validation messages Contents	Yellow! The power of attorney or a copy of the general power of attorney will need to be furnished unless all applicants sign the request form.
13-2-7	Validation messages Fees	Green? Please verify that modified fee amounts are correct.

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PCT-EASY INFORMATION SHEET

(For applicant use only, DO NOT submit this sheet with the international application)

VALIDATION LOG

	Names
Green?	Applicant 1.:Telephone No. missing
Green?	Applicant 1.:Facsimile No. missing
	Contents
Yellow!	The power of attorney or a copy of the general power of attorney will need to be furnished unless all applicants sign the request form.
	Fees
Green?	Please verify that modified fee amounts are correct.

Before submitting the International Application, please carefully verify that:

- the information contained on printed Request form is correct;
- Box IX of the Request form has been signed;
- all elements of the international application as indicated in Box VIII of the Request form have been attached; and,
- the diskette containing the PCT-EASY zip file of the International Application has been enclosed and has been clearly labeled "PCT-EASY", with the applicant's or agent's file reference, and the first applicant's name.

ATTENTION

DO NOT modify any indications on the Request form printout. The attached PCT-EASY application has been locked. If an error or an omission is discovered at this time, you must copy the submitted application as a template and make the change or correction in a new application (using the submitted application as a template). You may create such a template by copying the submitted application from the "Stored Forms" folder to the "New PCT Forms" folder. Open the new (.0WO) file created in the "New PCT Forms" folder, correct the errors and proceed with the submission process again.

Claims

1. Method for controlling bearers in a cellular telecommunication system,
characterized in that the method comprises steps, in which
 - 5 - a set of allowed transport format combinations is constructed, and
 - information for construction of said set at a receiver is communicated to the receiver.
2. A method according to claim 1, **characterized in that**
 - 10 said set of allowed transport format combinations is constructed by checking for each transport format combination, whether the combination is within predefined limits.
3. A method according to claim 1, **characterized in that**
 - 15 a transport format combination identifier is assigned to each combination of said set of allowed transport format combinations.
4. A method according to claim 3, **characterized in that**
 - 20 said assigning of transport format combination identifiers is performed according to a predefined rule.
5. A method according to claim 4, **characterized in that**
 - 25 said set of allowed transport format combinations is ordered according to at least the total bit rate of the transport format combinations, and said transport format combination identifiers are assigned so that the identifiers form a sequence of consecutive integer numbers.
6. A method according to claim 1, **characterized in that**
 - 30 said step of communicating information for construction of said set comprises the step of communicating of each allowed transport format combination to said receiver.
7. A method according to claim 1, **characterized in that**
 - 35 said step of communicating information for construction of said set comprises the step of communicating of each non-allowed transport format combination to said receiver.

8. A method according to claim 1, **characterized in that** said step of communicating information for construction of said set comprises the step of communicating at least one limit for construction of said set to said receiver.

5 9. A method according to claim 1, **characterized in that** said step of communicating information for construction of said set comprises the step of communicating information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination.

10 10. A method according to claim 1, **characterized in that** said step of communicating information for construction of said set comprises the step of specifying the differences between said set to a previous set of transport format combinations.

15 11. A method according to claim 1, **characterized in that** a bearer request is admitted, if at least one of the transport formats of the requested bearer is a part of an allowed transport format combination.

20 12. A method according to claim 3, **characterized in that** transport formats used in a transmission between a receiver and a transmitter are identified by sending a transport format combination identifier from the transmitter to the receiver.

25 13. A method according to claim 3, **characterized in that** if either party of the connection detects that the transport format combination identifiers of the receiver do not correspond to the transport format combination identifiers of the transmitter, the transport format combination identifiers are reconstructed at at least one party of the connection.

30 14. A method according to claim 13, **characterized in that** said step of reconstruction comprises the reconstruction of transport format combination identifiers at both parties of the connection according to a predefined rule.

35 15. A method according to claim 13, **characterized in that** in said step of reconstruction, one of the parties of the connection communicates its

transport format combination identifiers to the other party, which takes the communicated identifiers into use.

16. System for controlling bearers in a cellular telecommunication system

5 **characterized** in that the system comprises

- means for construction of a set of allowed transport format combinations in a network element of the cellular telecommunication system, and
- means for communication of a constructed set of allowed transport format combinations to a mobile communication means.

10

17. A system according to claim 16, **characterized** in that

said means for construction of a set of allowed transport format combinations comprises

- a memory element for storing a set of allowed transport format combinations,
- 15 - means for checking whether a single transport format combination is within predetermined limits, and
- means for adding a single transport format combination to said set of allowed transport format combinations stored in said memory element.

20

18. A system according to claim 16, **characterized** in that

said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises means for determining non-allowed transport format combinations.

25

19. A system according to claim 16, **characterized** in that the system further comprises means for storing a previously constructed second set of allowed transport format combinations,

and said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises

30

means for searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations.

20. A system according to claim 16, **characterized** in that the system further comprises means for assigning a transport format combination identifier to each
35 transport format combination stored in said memory element.

21. A system according to claim 16, characterized in that the system further comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission.

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q, H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 668669 A1 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.), 23 August 1995 (23.08.95) --	1-4,7-9
X,P	EP 697797 A2 (AT&T CORP.), 21 February 1996 (21.02.96), column 2, line 46 - column 3, line 54; column 10, line 6 - line 35 --	1-4,7-9
X,P	WO 9535002 A1 (QUALCOMM INCORPORATED), 21 December 1995 (21.12.95), page 2, line 28 - page 4, line 16; page 7, line 37 - page 8, line 9; page 10, line 23 - page 11, line 32, page 12, line 10 - page 14, line 10; page 16, line 24 - page 17, line 2 --	1-4,7-9

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 February 1997

Date of mailing of the international search report

20 -02- 1997

Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

2

International application No.

PCT/FI 96/00506

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 7135676 A (NEC CORP), 23 May 1995 (23.05.95) -- -----	1,7

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/02/97

International application No.

PCT/FI 96/00506

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP-A1-	668669	23/08/95	NONE		
EP-A2-	697797	21/02/96	NONE		
W0-A1-	9535002	21/12/95	NONE		
JP-A-	7135676	23/05/95	SE-A-	9403826	10/05/95

13 November 2000

European Patent Office
D-80298 Munich
Germany

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(7 pages)

Authorized Officer: von der Straten, G
Our ref: 48947/SKU/PKK

REPLY TO WRITTEN OPINION
INTERNATIONAL PATENT APPLICATION PCT/FI99/00925
APPLICANT: NOKIA NETWORKS OY
Due Date: 11 November 2000

As a response to the Written Opinion mailed on 11 August 2000 the independent claims (claims 1 and 16) of the patent application have been amended.

Replacement sheets 18-21, which contain the amended claims, are enclosed. Minor grammatical amendments are made to claims 17-19. The rest of the claims remain unchanged.

As a response to item VIII in the Written Opinion we respectfully present the following arguments.

The independent claims have been amended so that a bearer is defined in accordance with the description, page 1, lines 20-23. Furthermore, at least one transport format TF is specified in the independent claims for each bearer. This transport format is a set of parameters relating to properties of a bearer (page 1, rows 13-20).

One main idea in the present invention is to control jointly a number of bearers. This is done by constructing a set of allowed transport format combinations TFCS. A transport format combination TFC refers to a certain combination of transport formats for the bearers. By constructing a TFCS, the allowed bit rate combinations are restricted in accordance with the first object of the invention (allow the control of maximum total bit rate of all bearers of a user, while aiming to avoid as much as possible restrictions of use of the highest data rates by a bearer).

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Another main idea in the present invention is to communicate to a receiver information, which implicitly, and perhaps together with information the receiver already possesses, specifies the TFCS and allows the receiver to construct the same TFCS. The way in which the TFCS is constructed using the communicated information depends on the communicated information, and the dependent claims and the description give examples of this.

The amount of information implicitly specifying a TFCS is typically far less than the amount of information explicitly specifying, for example, a bit rate for each bearer and for each bearer combination. This way the information needed for communicating the bit rates of bearers from a transmitter to a receiver is reduced (second object of the invention). Furthermore, once a TFCS is constructed, each TFC belonging to said TFCS may be given an identifier TFCI, and a current transport format combination may be indicated using a TFCI (claims 3-5, 12-15)

The description supports the amendment in the independent claims by specifying examples of predefined information using which – together with the communicated information – a receiver may construct the TFCS. See, for example, Sections B.4, C.3 and C.4 of the description.

The steps in the amended method claim 1 are in a logical order. First, a set of allowed transport format combinations is constructed. This is typically done in the cellular network. Thereafter information specifying the constructed set of allowed transport format combinations is communicated to a receiver, typically to a mobile station. The same is true for the amended claim 16.

As a response to items V and VII in the Written Opinion we respectfully present the following arguments.

Document D1 mentions negotiation of a set of parameters relating to a bearer. This set of parameters is equivalent to a transport format. Document D1 thus reveals negotiations the outcome of which is one selected transport format; it does not reveal a construction of a set of allowed transport formats for a bearer. Furthermore, the set of parameters is most probably negotiated by stating explicitly to the other communicating party, for example, a desired data rate, a minimum data rate, a maximum instantaneous data rate and a maximum transmission delay. Document D2 presents, similarly, an example of a parameter set negotiation for one data connection.

Documents D1 and D2 discuss negotiations of a set of parameters for one bearer or for one data connection. They do not discuss joint control of a number of bearers or data connections. Therefore, we argue that the idea of performing

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joint control of a number of bearers by defining a set of allowed transport format combinations is new and inventive in view of those documents.

A second inventive feature specified in the amended claims is the communication of information, which only implicitly defines the set of allowed transport format combinations. Only few details are presented in documents D1 and D2, but at that time the state of the art was to explicitly state the desired parameters. The advantages of transmitting only implicit information are discussed above.

We respectfully argue that the independent amended claims specify an inventive method and an inventive system, and a reconsideration of the Written Opinion is therefore requested.

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Encls. Amended Claims

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Claims

1. Method for controlling a number of bearers, said bearers being data transmission paths relating to a receiver and each bearer having at least one transport format (TF) describing properties of said bearer, in a cellular telecommunication system,
5 **characterized** in that the method comprises steps, in which
 - a set of allowed transport format combinations (TFCS) is constructed (100), a transport format combination (TFC) being a combination of transport formats (TF) of a number of bearers, and
 - 10 - information, which is different from information explicitly specifying for each allowed transport format combination (TFC) the transport format (TF) for each bearer and which implicitly specifies said set of allowed transport format combinations (TFCS), is communicated (120) to the receiver so that said information, together with predefined information possessed by the receiver, enables
15 the receiver to construct said set of allowed transport format combinations (TFCS).
2. A method according to claim 1, **characterized** in that said set of allowed transport format combinations is constructed by checking for each transport format combination, whether the combination is within predefined
20 limits.
3. A method according to claim 1, **characterized** in that a transport format combination identifier is assigned to each combination of said set of allowed transport format combinations.
25
4. A method according to claim 3, **characterized** in that said assigning of transport format combination identifiers is performed according to a predefined rule.
- 30 5. A method according to claim 4, **characterized** in that said set of allowed transport format combinations is ordered according to at least the total bit rate of the transport format combinations, and said transport format combination identifiers are assigned so that the identifiers form a sequence of consecutive integer numbers.
35
6. A method according to claim 1, **characterized** in that

said step of communicating information for construction of said set comprises the step of communicating of each allowed transport format combination to said receiver.

5 7. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating of each non-allowed transport format combination to said receiver.

10 8. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating at least one limit for construction of said set to said receiver.

15 9. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination.

20 10. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of specifying the differences between said set to a previous set of transport format combinations.

25 11. A method according to claim 1, **characterized** in that a bearer request is admitted, if at least one of the transport formats of the requested bearer is a part of an allowed transport format combination.

30 12. A method according to claim 3, **characterized** in that transport formats used in a transmission between a receiver and a transmitter are identified by sending a transport format combination identifier from the transmitter to the receiver.

35 13. A method according to claim 3, **characterized** in that if either party of the connection detects that the transport format combination identifiers of the receiver do not correspond to the transport format combination identifiers of the transmitter, the transport format combination identifiers are reconstructed at at least one party of the connection.

14. A method according to claim 13, **characterized** in that
said step of reconstruction comprises the reconstruction of transport format
combination identifiers at both parties of the connection according to a predefined
5 rule.

15. A method according to claim 13, **characterized** in that
in said step of reconstruction, one of the parties of the connection communicates its
transport format combination identifiers to the other party, which takes the
10 communicated identifiers into use.

16. System for controlling bearers in a cellular telecommunication system, said
bearers being data transmission paths relating to a mobile communication means
and each bearer having at least one transport format (TF) describing properties of
15 said bearer, **characterized** in that the system comprises
- means for constructing a set of allowed transport format combinations (TFCS), a
transport format combination (TFC) being a combination of transport formats (TF)
of a number of bearers, in a network element of the cellular telecommunication
system, and
20 - means for communicating information, which is different from information
explicitly specifying for each allowed transport format combination (TFC) the
transport format (TF) for each bearer and which implicitly specifies said set of
allowed transport format combinations (TFCS), to the mobile communication means
so that said information, together with predefined information possessed by the
25 mobile communication means, enables the mobile communication means to
construct said set of allowed transport format combinations (TFCS).

17. A system according to claim 16, **characterized** in that
said means for constructing a set of allowed transport format combinations
30 comprises
- a memory element for storing a set of allowed transport format combinations,
- means for checking whether a single transport format combination is within
predetermined limits, and
- means for adding a single transport format combination to said set of allowed
35 transport format combinations stored in said memory element.

18. A system according to claim 16, **characterized** in that

said means for communicating a constructed set of allowed transport format combinations to a mobile communication means comprises
means for determining non-allowed transport format combinations.

- 5 19. A system according to claim 16, **characterized** in that the system further comprises means for storing a previously constructed second set of allowed transport format combinations,
and said means for communicating a constructed set of allowed transport format combinations to a mobile communication means comprises
10 means for searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations.

20. A system according to claim 16, **characterized** in that the system further comprises means for assigning a transport format combination identifier to each
15 transport format combination stored in said memory element.

21. A system according to claim 16, **characterized** in that the system further comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00925

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP 0954187 A1 (NOKIA MOBILE PHONES LTD.), 3 November 1999 (03.11.99), column 4, line 24 - line 37; column 5, line 27 - line 57, abstract --	1,16
P,A	WO 9939528 A1 (NOKIA TELECOMMUNICATIONS OY), 5 August 1999 (05.08.99), abstract --	1,16
E,A	EP 0981229 A2 (LG ELECTRONICS INC.), 23 February 2000 (23.02.00), abstract --	1,16

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

12 April 2000

Date of mailing of the international search report

24.05.2000

Name and mailing address of the International Searching Authority
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Fax(+31-70)340-3016

Authorized officer

Jaana Raivio/cs
Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00925

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 9952307 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 14 October 1999 (14.10.99), page 4, line 6 - page 6, line 4 --	1,16
P,A	WO 9949684 A2 (SIEMENS AKTIENGESELLSCHAFT), 30 Sept 1999 (30.09.99), abstract --	1,16
A	EP 0836291 A2 (NORTHERN TELECOM LIMITED), 15 April 1998 (15.04.98), abstract -- -----	1,16

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 99/00925

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
EP	0954187	A1	03/11/99	FI 980923 D WO 9956437 A	00/00/00 04/11/99
WO	9939528	A1	05/08/99	FI 3556 U FI 980208 D,V	31/08/98 27/04/98
EP	0981229	A2	23/02/00	NONE	
WO	9952307	A1	14/10/99	US 5923592 A	13/07/99
WO	9949684	A2	30/09/99	NONE	
EP	0836291	A2	15/04/98	GB 9621333 D JP 10136441 A	00/00/00 22/05/98

PCT

REC'D 12 FEB 2001

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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

15

Applicant's or agent's file reference 48947/ML/MM	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00925	International filing date (day/month/year) 05/11/1999	Priority date (day/month/year) 06/11/1998
International Patent Classification (IPC) or national classification and IPC H04Q7/38		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 29/05/2000	Date of completion of this report 08.02.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer von der Straten, G Telephone No. +49 89 2399 8994



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI99/00925

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

Description, pages:

1-17 as originally filed

Claims, No.:

1-21 as received on 16/11/2000 with letter of 13/11/2000

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI99/00925

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-21
	No: Claims
Inventive step (IS)	Yes: Claims 1-21
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-21
	No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00925

1. Reference is made to the following documents:

D1 = SCHIEDER A. ET AL: "GRAN - A new Concept for Wireless Access in UMTS", ISS '97 INTERNATIONAL SWITCHING SYMPOSIUM, TORONTO , 21. September 1997-26. September 1997, vol. 2, no. , pages 339 to 345

D2 = US, A, 5644715

2. **Concerning item V**

- a. The application as per the preamble of **claim 1** relates to a method for controlling bearers each bearer having at least one transport format. Methods for controlling bearers are known in the art and in particular from document **D1**, which forms the closest prior art.

Document **D1**, discloses, in accordance with the features of the preamble of **claim 1**, a method for controlling a bearer in a mobile communication environment. The parameters of the bearer, in particular traffic parameters as, for instance, the data rate and quality of service parameters as, for instance, the bit error rate, are negotiated between transmitter and receiver at call set up.

Document D2 discloses a method of establishing multi-media conference calls between a plurality of computers. The quality of service parameter for each computer are collected and stored. At the time of the conference call the connections are established according to the stored parameters.

The method of **claim 1** differs from that of D1 in that a number of bearers is controlled. According to the characterizing portion of claim 1 a set of allowed transport format combinations is constructed from transport formats of a number of bearers. Information relating to this transport format combination is transmitted to the receiver in such a way that the receiver is enabled to construct the set of transport format combinations.

This claimed method of constructing and transmitting transport format combinations of bearers is neither taught, nor rendered obvious, alone or in

combination, by documents D1 and D2, the prior art documents acknowledged in the description or cited in the International Search Report.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT. The subject-matter of claim 1 is also industrially applicable.

- b. The same applies to independent **claim 16**, which is directed to a system based on the same concepts. Claim 16, therefore, equally meets the requirements of Article 33(1) PCT.
- c. Dependent **claims 2 - 15 and 17 - 21** relate to further implementing details of the method and apparatus defined by the independent claims to which they refer and are therefore equally novel, inventive and industrially applicable.

3. **Concerning item VII**

The relevant prior art, i.e. the documents D1 and D2 noted above, should have been acknowledged by reference and briefly discussed in the introductory part of the description, Rule 5.1.(a),(ii) PCT.

All the claims should include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.

The general "spirit and scope" statement in the description at page 17, **lines 20 - 21** is unclear, and when used to interpret the claims renders them also unclear, contrary to Article 6 PCT. The statement should therefore have been deleted.

PCT

NOTIFICATION DE L'ENREGISTREMENT
D'UN CHANGEMENT(règle 92bis.1 et
instruction administrative 422 du PCT)

Expéditeur: le BUREAU INTERNATIONAL

Destinataire:

ECREPONT, Robert
Société Civile Cabinet Ecrepont
27bis rue du Vieux Faubourg
F-59800 Lille
FRANCE

Date d'expédition (jour/mois/année)

12 janvier 2001 (12.01.01)

Référence du dossier du déposant ou du mandataire

P 121 312 INT

NOTIFICATION IMPORTANTE

Demande internationale no

PCT/FR99/00925

Date du dépôt international (jour/mois/année)

20 avril 1999 (20.04.99)

1. Les renseignements suivants étaient enregistrés en ce qui concerne:

☐ le déposant☐ l'inventeur☒ le mandataire☐ le représentant commun

Nom et adresse

ECREPONT, Robert
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12, place Simon Vollant
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Nationalité (nom de l'Etat)

Domicile (nom de l'Etat)

no de téléphone

03.20.52.32.26

no de télécopieur

03.20.88.08.04

no de téléimprimeur

2. Le Bureau international notifie au déposant que le changement indiqué ci-après a été enregistré en ce qui concerne:

☐ la personne☐ le nom☒ l'adresse☐ la nationalité☐ le domicile

Nom et adresse

ECREPONT, Robert
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Nationalité (nom de l'Etat)

Domicile (nom de l'Etat)

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03 20 63 28 88

no de télécopieur

03 20 63 28 90

no de téléimprimeur

3. Observations complémentaires, le cas échéant:

4. Une copie de cette notification a été envoyée:

☒ à l'office récepteur☐ à l'administration chargée de la recherche internationale☒ à l'administration chargée de l'examen préliminaire international☐ aux offices désignés concernés☒ aux offices élus concernés☐ autre destinataire:Bureau international de l'OMPI
34, chemin des Colombettes
1211 Genève 20, Suisse

no de télécopieur (41-22) 740.14.35

Fonctionnaire autorisé:

Sean Taylor

no de téléphone (41-22) 338.83.38

003769920

Method for controlling bearer properties

TECHNICAL FIELD OF THE INVENTION

5

The invention concerns the control of connections in cellular telecommunication systems.

BACKGROUND OF THE INVENTION

10

In cellular telecommunication systems a single speech connection or data connection through the cellular telecommunication network is called a bearer. Generally, a bearer is associated with a set of parameters pertaining to data communication between a certain terminal equipment and a network element, such as a base station or an interworking unit (IWU) connecting the cellular network to another telecommunications network. The set of parameters associated with a bearer comprises typically for example data transmission speed, allowed delays, allowed bit error rate (BER), and the minimum and maximum values for these parameters. A bearer may further be a packet transmission bearer or a circuit switched bearer and support for example transparent or non-transparent connections. A bearer can be thought of as a data transmission path having the specified parameters connecting a certain mobile terminal and a certain network element for transmission of payload information. One bearer always connects only one mobile terminal to one network element. However, a bearer can pass through a number of network elements. One mobile communication means (ME, Mobile Equipment) may in some cellular telecommunication systems support one bearer only, in some other systems also more than one simultaneous bearers.

In the new cellular telecommunication systems such as the UMTS system (Universal Mobile Telecommunication System) under development, variable bit rate bearers will be in much more widespread use than in the present systems. Multiple simultaneous bearers with multiple bit rate options will result in high amount of combinations to be supported. It is desirable that also the air interface part of the communications system supports this kind of bearer combinations efficiently, i.e. without excessive use of radio resources. Since the bit rates of bearers may change from frame to frame, the bit rates need to be indicated in the frames. Assuming that all possible combinations of instantaneous bit rates of different bearers shall be supported, the amount of bits required for identification of the transmission rate of a

radio frame may become excessive. On the other hand, fixed allocation of radio resources according to the maximum possible total bit rate is not feasible. Maximum bit rates of the bearers may be rarely used and if the resources allocated for a user are dimensioned based on the worst case combination i.e. all bearers using the highest possible bit rate, scarce radio resources will be wasted.

SUMMARY OF THE INVENTION

An object of the invention is to realize a method for controlling the bearers, which allows the control of maximum total bit rate of all bearers of a user, while aiming to avoid as much as possible restrictions of use of the highest data rates by a bearer. A further object of the invention is to realize a method, which reduces the amount of data transmission needed for communicating the bit rates of bearers from a transmitting entity to a receiving entity.

The objects are reached by restricting the allowed bit rate combinations, associating an identifier with each allowed combination, and identifying the instantaneous transmission rate using the identifier associated with the particular combination.

The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The system for controlling bearers in a cellular telecommunication system according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a system for controlling bearers in a cellular telecommunication system. The dependent claims describe further advantageous embodiments of the invention.

According to the invention, the available radio resources are controlled by allowing only certain combinations of transport formats to be used by a single user. The inventive method restricts the combinations of bearer bit rates which can be used, without strictly limiting some bearers from using highest bit rates. Consequently, depending on the available resources, one bearer may well use its highest data rate, possibly even more bearers than one, although the total resource usage of all bearers of the user may be restricted. This inventive approach allows flexible overall control of radio resources, while retaining the possibility for bearers to select between different bit rates.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

5

Figure 1 illustrates a method according to an advantageous embodiment of the invention,

10

Figure 2 illustrates another method according to an advantageous embodiment of the invention,

Figure 3 illustrates a system according to an advantageous embodiment of the invention, and

15

Figure 4 illustrates a further method according to an advantageous embodiment of the invention.

Same reference numerals are used for similar entities in the figures.

20

DETAILED DESCRIPTION

In the following discussion, the term bit rate refers to the bit rate after channel coding, i.e. the bit rate actually transmitted over the air interface, and not the payload data bit rate unless otherwise specified.

25

According to the present invention, transmission of a single mobile communication means is controlled by controlling the allowed bit rate combinations of the bearers of the mobile communication means. The allowed combinations of bearer bit rates are restricted in such a way, which does not refuse the possibility of using the highest bit rates for some bearers.

30

To aid in the description of the invention, certain terms are defined in the following.

35

A transport format (TF) is a set of parameters, which correspond to a single way of preparing a payload data stream for transmission over the air interface. The set of parameters indicate for example payload data rate, the error control coding method used, interleaving method used, and other processing methods used in the particular cellular telecommunications network, i.e. describe the physical layer processing

applied to the data to be transmitted. Consequently, each TF corresponds to a specific instantaneous bearer bit rate. Further, each bearer has at least one transport format. In the case of a bearer supporting for example multiple bit rates, a bearer can have more than one corresponding TF.

5

Each transport format has a corresponding transport format identifier (TFID). The TFIDs can be assigned to TFs in many ways, for example in ascending order starting from the lowest bit rate, or according to some other predefined rule.

- 10 The combination of transport formats of the active bearers is a Transport Format Combination (TFC). The set of all possible transport format combinations form a Transport Format Combination Set (TFCS). Each TFC has a corresponding transport format combination identifier (TFCI), i.e. each TFCI corresponds to a definite group of transport formats. The TFCI is used to inform the current
15 combination of transport formats to the receiver. The TFCI:s are preferably integer numbers.

A. Determination of allowed combinations

- 20 The determination about which combinations can be used and which cannot can be made on the basis of many different requirements according to the needs of the particular embodiment of the invention. Some examples of such requirements are given in the following.

25 A.1. An example of a limit: size of TFCI word

- In order to further reduce the amount of data transmission needed for transmission of transport format information over the air interface to the receiver, the size of the TFCI word can be changed. If the TFCI word has m bits, the maximum number N of
30 combinations that can be represented is $N = 2^m$. Consequently, the length of the TFCI word simply limits the number of allowed combinations. The length of the TFCI word can be adjusted to give a suitable compromise between use of transmission resources for transmitting the TFCI word and the variety of transport format combinations available. In an advantageous embodiment of the invention, the
35 length of the TFCI word can be changed during a connection.

A.2. An example of a limit: maximum bit rate for the user

In a further advantageous embodiment of the invention, maximum allowed bit rate of a user is used in the determination of allowed transport format combinations. In
5 such an embodiment, the allowed combinations include all transport combinations, whose total bit rate is less than or equal to the maximum bit rate for a user.

In various embodiments of the invention, the maximum bit rate may be user-dependent, some users having a different maximum limit from that of others. This
10 provides one way of prioritization of users, for example to provide high-paying users and otherwise prioritized users such as rescue workers a better service than to the rest of users.

A.3. Other grounds for combination decisions

15 In addition to the previously mentioned limits, other information can be used in making decisions about allowed transport format combinations. This kind of information may for example comprise priorities of the bearers, measured throughputs for each bearer as well as the aggregate throughput for the user in
20 question, current load in the cell and interference levels.

B. Construction of TFCS

The construction of the transport format combination set and the assigning of
25 transport format combination identifiers to the various combinations can be performed in many different ways. Some examples of these ways are presented in the following.

B.1 A first example

30 Preferably, a table of the allowed transport format combinations is constructed, whereby the table index can be used as the TFCI. Thereafter, only the table index i.e. the TFCI needs to be communicated between the transmitter and the receiver. However, the invention is not limited to using tables, since other means such as
35 linked lists or other data structures can be used for associating a transport format combination and a TFCI.

B.2 A second example

Further, a predefined algorithm or rule can be used to generate the TFCI corresponding to a TFC, whereafter the TFCI found in this way can be used as the index to a table for storing the different allowed combinations. The TFCI of a TFC can be determined for example according to the following algorithm:

1. $factor = L(K)$
2. $TFCI = TFID(K)$
3. step through all values of j from $K-1$ to 1, repeating 3a and 3b:
 - 10 3a. $TFCI = TFCI + TFID(j) * factor$
 - 3b. $factor = factor * L(j)$

where

- $factor$ is a temporary variable used in the algorithm,
 15 $L(j)$ is number of TF:s for bearer j ,
 $TFID(j)$ is TFID of the TF of bearer j , and
 K is the number of active bearers.

20 This algorithm assumes that TFIDs are assigned to TFs in ascending order starting from the lowest bit rate, the first TFID being zero.

B.3 A third example

25 In a further advantageous embodiment of the invention, the TFCI values are assigned simply by iterating through all combinations of all transport formats of the bearers, checking for each combination whether the combination is allowed or not. If the combination is allowed, the next free TFCI value is assigned to the combination. For example, the allowed combination can be entered into the next free position in a table containing the TFCS, the index of the position then being the
 30 assigned TFCI.

B.4 A fourth example

In a still further advantageous embodiment of the invention, TFCI values are classified into two categories: active and inactive values. Active values are those values which are in use, and inactive values those that are not in use. In such an embodiment, new services can be taken into use by specifying the corresponding TFCI values to be active. If some transport format combinations are removed from use, the corresponding TFCI values are simply specified to be inactive. Such an embodiment has the advantage, that the timing of the changes in the TFCS and TFCI values is not very critical, since other active TFCI values remain unchanged. It is enough from the viewpoint of timing, that any new TFCI values are not used before the receiver has had enough time to receive the message specifying the new values and to change the TFCS and TFCI configuration. In such an embodiment, the message specifying that a TFCI value is now active may for example comprise also the specification of the TFC corresponding to the TFCI. In further embodiments of the invention, the TFC corresponding to a TFCI specified to be active may be previously known by the receiver, or may be deduced from the TFCI by the receiver according to a predefined rule. For example, all possible combinations of transport formats of the bearers can be stored in a table whose index values correspond to the TFCI values, and only those TFCI values are used, which are specified to be active.

B.5 A fifth example

In a further advantageous embodiment, the transport format combinations and the corresponding TFCI values are ordered according to the total bit rate of the TFC or some other desired criteria. In such an embodiment, the allowed transport format combinations are indicated simply by indicating the highest allowed TFCI. In such an embodiment, when a new TFC is allowed, the new TFC is inserted in the corresponding location in the ordered sequence of transport format combinations and given the TFCI value corresponding to that position in the sequence. The TFCI values are updated accordingly, i.e. the higher TFCI values are incremented by one. In a similar way, when a TFC is removed from use, it is removed from the ordered sequence, and the TFCI values are updated accordingly.

Preferably, the TFCI of the TFC with lowest bit rate is 0, the TFCI of the TFC with the next lowest bit rate is 1, and so on. However, this numbering scheme is not the only possible method that can be used in various embodiments according to the

section B.5 of this specification. Preferably, the TFCI values form a sequence of consecutive integer numbers.

5 The ordering of transport format combinations and the corresponding TFCI values may take into account also other parameters than the total bit rate of a TFC. For example, if more than one transport format combination has the same total bit rate, these combinations can be ordered according to their relative priority.

10 In this embodiment, a mobile station can request more resources simply by indicating a new desired highest allowed TFCI in the resource request, to which the network can reply by allocating more resources if possible, and returning a possibly new highest allowed TFCI limit.

15 C. Changing of the set of allowed transport formats

The transport format combination set (TFCS) needs to be known both to transmitter and receiver. Each time new variable rate bearer requires establishment of a connection or an old connection is released the TFCS is changed. Further, it may be desirable to restrict the use of certain combinations for some other reasons. To
20 ensure that the transport format combination sets in the transmitter and in the receiver correspond to each other, the set or any changes to the set may need to be signalled from the transmitter to the receiver. Some ways to signal the TFCS according to various advantageous embodiments of the invention are described in the following.

25 C.1 Signalling of TFCS by explicit recitation

In an advantageous embodiment of the invention, the TFCS is signalled from a first end of a connection to a second end of the connection by explicitly reciting all
30 allowed combinations. This embodiment is advantageous, if the number of allowed combinations is relatively small compared to the total number of combinations. In this embodiment, the first end sends one or more messages to the second end, which messages specify at least all allowed combinations, and for each combination specify one TFID at least for each bearer having more than one transport format.

35 In a further advantageous embodiment of the invention, the TFCS is signalled from a first end of a connection to a second end of the connection by explicitly reciting all those combinations, which are not allowed. This embodiment is advantageous, if

the number of non-allowed combinations is smaller than the number of allowed combinations. In this embodiment, the first end sends one or more messages to the second end, which messages specify at least all non-allowed combinations, and for each combination specify one TFID at least for each bearer having more than one transport format.

In a further advantageous embodiment of the invention, the message or messages specifying the allowed or non-allowed combinations, also specify whether the recited combinations are allowed or not. This allows the use of the same message type for specifying allowed and non-allowed combinations.

C.2 Signalling of the TFCS by indicating construction limits

In another advantageous embodiment of the invention, the end of the connection deciding about the allowed combinations informs the other end of the connection only about which limits and other information are to be used in construction of the TFCS. Such a limit may be for example the maximum total bit rate of a single user, and such other information may be for example the priorities of the bearers. Thereafter, the other end constructs the TFCS independently following the specified limits. Since the same limits are used at both ends, the resulting TFCS will be the same. The construction of the TFCS may proceed for example by going through all possible transport format combinations, and checking for each one whether the combination is allowed or not.

C.3 Signalling of the TFCS by indicating specific transport formats

If the restriction of the combinations is to be done in such a way that some transport formats of some bearers are not used in any of the allowed combinations, the TFCS can be specified with bearer specific messages restricting the use of one or more transport formats of a specific bearer.

In a further advantageous embodiment of the invention, the TFCS is specified with bearer specific messages indicating, which transport formats can be used.

C.4 Further methods

The previous methods have given examples of methods, in which the TFCS is constructed from scratch by indicating allowed or non-allowed transport formats or

combinations of transport formats. However, a new TFCS may also be defined by specifying the changes in the allowed transport format combinations and transport formats relative to the previous TFCS. The messages may specify whether the item being specified is to be allowed or restricted. The item being specified in a message
5 may be for example a TFC, a bearer, or a single transport format of a bearer. For example, the new TFCS may be specified by a message, which restricts the use of one or more transport formats of a specific bearer.

After specifying the changes in the allowed combinations, transport formats and/or
10 bearers, the TFCS is preferably reconstructed so that the TFCS contains only allowed combinations, and the TFCI values updated to correspond to the new TFCS.

The previously described ways of specifying the TFCS to a receiver are examples
15 only and do not limit the invention in any way. Many other ways of specifying a set of combinations or for example different combinations of the previously described ways can as well be used in various embodiments of the invention.

20 D. Time of validity

In the previous examples of specifying the TFCS, the message or messages carrying the specifying information of TFCS may also comprise an indication of the starting time, after which the new TFCS is valid. However, the starting time of validity may also be defined implicitly, e.g. the new TFCS may be valid from the time the
25 specifying message arrives or in the case of more than one message being used to specify the TFCS, from the receiving time of the last of these messages.

E. Examples of admission control methods according to the invention

30 The cellular telecommunications network can use for example the previously described TFCS construction limits at least partly as the admission condition in an admission control method. For example, the system can determine how many TFCI bits would be required to represent all combinations in the TFCS based on the size of the TFCS and the transport formats of all the bearers. If the amount of TFCI bits
35 is less than equal to a maximum TFCI word length, the network can then refuse the bearer request, or for example in the case of a high priority request, refuse the service from other already established bearers. As another example, the maximum

bit rate limit may be considered. In such an example, the bearer is advantageously admitted, if at least some of its transport formats result in an allowed combination. Consequently, a multi-bit-rate bearer may be only partially admitted, i.e. admitted with a restricted selection of bit rates.

5

If the requested bearer has higher priority than some other bearers, the cellular network preferably allocates resources for the higher priority bearer first and restricts the bit rates of the other bearers to such values, that the resulting TF combination is an allowed combination. This may result in the adjustment of
10 transport format for a bearer having a lower priority, or even refusing the service for a bearer having a lower priority.

Each bearer requiring establishment of a connection preferably indicates the variability of the user bit rate in a predefined way, e.g. using a predefined signalling
15 procedure. The network then determines transport formats for the requested bearer and updates the TFCS accordingly, if the network can provide service for the bearer or for at least some of its transport formats.

Figure 1 shows the flow diagram of an advantageous embodiment of the invention.
20 Figure 1 illustrates one example of the use of the inventive method in admission control. In step 135, a bearer request is received. As a response to the request, a TFCS is constructed in step 100. The step 100 of construction of a TFCS may also take into account the priority of the requested bearer as described previously. After the TFCS is constructed, it is checked in the following step 140 if the bearer belongs
25 to any allowed combination. If the bearer is not a part of any allowed combination, the bearer is refused at step 150, after which the method is ended without taking the newly constructed TFCS into use. If the bearer is found to be a part of at least one TFC, the bearer is admitted in step 145. At the next step 120, the new TFCS is communicated to the receiver, after which the communicated TFCS is taken into use
30 at step 155, after which the method is ended.

In further advantageous embodiments of the invention, the admission requirement may be different from the example of step 140 of Figure 1. For example, the bearer may be allowed only, if at least one transport format of the bearer is allowed in all
35 combinations. Further, the bearer may also be allowed, if at least one transport format of the bearer is allowed in at least a predefined part of all combinations. In a further advantageous embodiment of the invention, a real time bearer is allowed only, if the highest transport format of the bearer is allowed in at least one TFC.

F. An example of a method

In the following, an example of a method according to an advantageous embodiment of the invention is presented. The method is described with reference to Figure 2, which illustrates as a flow diagram the construction 100 of a transport format combination set and the communication 120 of information to the receiver for construction of the same set at the receiver.

In this example, the step of construction 100 of a TFCS comprises the following steps 102, 104, 106, 107, and 108. All combinations are examined one by one, starting with step 102, in which the next, or at the first time after start of the method, the first combination is taken into consideration. In step 104 it is checked, whether the combination is within the predefined limits, such as within a predefined maximum total bit rate limit. If the combination is within the limits, the combination is added to the TFCS at step 106, and a TFCI is assigned to the combination in step 107. If the combination is not within the limits, the method is continued directly at step 108. In either case, in step 108 it is checked if the combination is the last one to be considered. If the combination is not the last one, it is returned back to step 102. If the combination is the last one, the method is continued at step 120.

In this example, the step of communication 120 of information to the receiver for construction of the set at the receiver comprises the following steps 121, 122, 124, 126, 128, 130, and 136. At step 121, the way of communicating the TFCS to the receiver is chosen. In this example, the steps 122, 124, 126, 128, 130, and 136 represent different ways of communicating the TFCS. At step 122, each allowed transport format combination is communicated to the receiver. At step 124, each non-allowed transport format combination is communicated to the receiver. At step 126, predefined limits for construction of the TFCS are communicated to the receiver. At step 128, information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination is communicated to the receiver. At step 130, differences between the TFCS being communicated and a previous TFCS are communicated to the receiver.

The steps 122, 124, 126, 128, and 130 may comprise communication of all necessary information at one method step, or communication of only part of all necessary information. Therefore, at step 136 it is checked if the whole TFCS has been specified. If the whole TFCS has not been specified, it is returned back to step

121 for continuing the communication of the TFCS to the receiver. If the whole TFCS has been specified, the method is ended.

5 In the step 107 of assigning a TFCI to a combination, the assignment may be performed simply by assigning the next free TFCI value for the combination. Any other method or predefined rule of assigning TFCI values can be used, for example any of those described in the previous section B in this specification.

G. An example of a system

10

Figure 3 illustrates an example of a system according to an advantageous embodiment of the invention. Figure 3 shows mobile communication means 505, base stations 510, a network element 520 and the rest of a cellular telecommunications network 550. The network element 520 may be for example a
15 radio network controller (RNC) of the UMTS cellular telecommunications network. The network element further comprises a processing unit 521 such as a microprocessor and a memory element 522 for storing programs for the processing unit and one or more transport format combination sets.

20 Further, according to this example the system comprises means 521 for construction of a set of allowed transport format combinations in a network element of the cellular telecommunication system, and means 521, 510 for communication of a constructed set of allowed transport format combinations to a mobile communication means 505.

25

During construction of a TFCS, the processor unit 521 performs the previously described checking whether a single transport format combination is within the predetermined limits. The processor unit 521 can perform this task by executing a program 523 stored in the memory means 522, which program directs the processor
30 unit to perform the task. If a transport format combination is found to be within the limits, the processor unit 521 adds the combination to the set of allowed transport format combinations 529 stored in the memory means 522. Preferably, the processor unit also assigns a transport format combination identifier (TFCI) to each transport format combination. The transport format combination identifiers can also be stored
35 in the memory means 522.

The processor unit 521 can also take care of the communication of the constructed TFCS to the receiver, in this case the mobile communication means 505 with the

help of other components of the cellular telecommunications network such as base stations 510. The previously described method steps, such as for example determining non-allowed transport format combinations or searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations can be realized using a program 524 stored in the memory means 522, which program directs the processing unit 521 to perform the method step. Further, the system may store more than one TFCS in the memory means, such as a previously constructed TFCS 529b, which can be used for example in determining the differences between a newly created TFCS and a previously created and communicated TFCS, after which a new TFCS can be communicated to the receiver simply by communicating the differences between the old and new TFCS. The receivers 505 store the communicated TFCS 506 in a memory means in the receiver, whereafter they are able to determine the current transport format combination on the basis of a received TFCI.

Preferably, the system also comprises means for assigning a transport format combination identifier to each transport format combination stored in said memory element. These means may comprise for example the processing unit 521, which can assign TFCI values to transport format combinations for example according to any of the embodiments of the invention described previously.

Preferably, the system also comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission. These means may comprise for example the processing unit 521, which can add the TFCI of the currently used TFC into the data transmitted to a receiver.

In an advantageous embodiment of the invention, also a mobile communication means 505 can comprise the means 521, 522, 523, 524, 525, 529, and 529b, or other means providing similar functionality. Although conventionally it is the network which decides about radio resource usage, the mobile communication means preferably has the capability and functionality needed for construction of a TFCS for example, according to the embodiments of the invention described in section C.2 in this specification, or according to other rules and limits set by the network.

H. A further example of a method

The TFCI values can be used to indicate, which transport formats are used in a transmission. For example, a TFCI value can be transmitted in each transmission

frame to describe the transmission format or transmission formats used in the frame. In another exemplary embodiment, a TFCI value can be transmitted each time, when the transport format combination is changed. Figure 4 illustrates one example of signalling according to an advantageous embodiment of the invention. Figure 4 illustrates events during communication between a transmitting party and a receiving party, such as, respectively, a mobile communication means and a base station of a cellular telecommunications network. First, a TFCI is sent from the transmitter to the receiver in step 610 for indicating, which transport formats are used in the next unit of transmission. In the next step 615, data is transmitted from the transmitter to the receiver, using the transport formats specified by the TFCI value transmitted in the previous step. In various embodiments of the invention, the order of sending of the TFCI value and the data which the TFCI value refers to, does not necessarily need to be that shown in figure 4. For example, in such systems in which data is transmitted in frames, such as in the GSM system, the TFCI value can be sent in the same transmission frame as the data which the TFCI value refers to, in which case the exact order of the data and the TFCI value is not important and can be set according to the requirements of the particular application.

I. Further considerations

In some advantageous embodiments of the invention, the TFCS used for transmission by a party and the TFCS used for reception by the same party do not need to be the same. This is advantageous for example when the amount of radio resources reserved for uplink communication is different from the amount of radio resources reserved for downlink communication. Such a situation is possible for example in the HSCSD (High Speed Circuit Switched Data) mode in GSM networks. Such an arrangement is advantageous for example in data terminal use when browsing information databases or the Internet, where only short requests are transmitted from the mobile communication means, but large amounts of information are returned from the data networks. In such embodiments of the invention, a communicating party preferably has at least two transport format control sets, one of which is used for reception and one for transmission.

In a further advantageous embodiment of the invention, multiple transport format combination sets are used to further reduce transport format signalling between a receiver and a transmitter. In such an embodiment, a plurality of transport format combination sets is constructed and communicated to the receiver, after which the current TFCS to be used is selected simply by sending a TFCS identifier to the

receiver. Such an embodiment reduces signalling over the air interface in such a case, in which some transport format combination sets are used relatively often. The plurality of transport format combination sets preferably comprises such sets, which are constructed as a result of most common bearer sets and limits, such as the
5 maximum total bit rate for a user.

In such a case, when the allowed transport format combinations are limited by certain limits, which allow straightforward determination of allowability for a TFC, and the TFCI values are constructed according to a certain rule, explicit
10 construction of a TFCS is not necessary for both parties of the connection. For example, the transmitting party may simply check if a new TFC is allowable according to the limits, and if the TFC is allowed, use the TFC in transmission, generating the TFCI on the fly. The receiving party can then use the TFCI as an index to a table containing the TFCS or, if the transport formats can be deduced
15 from the specified TFCI using an inverse of the rule used for generating the TFCI, determine the used transport formats directly from the TFCI. Therefore, the existence of an explicit TFCS is not necessary in all embodiments of the invention.

In some circumstances, as a result of some kind of an error situation, it may be
20 possible that the receiver and the transmitter have assigned the same TFCI to different transport format combinations. If such an error situation occurs, data transmission does not succeed, since the receiver attempts to interpret the received data stream in a different way than the data stream was constructed. Recovery from such an error situation can proceed in many ways in various embodiments of the
25 invention. For example, according to one advantageous embodiment of the invention, the party which detects the error, informs the other end about the error, whereafter both ends reconstruct their TFCI values for example according to some of the previously described examples, such as those described in sections B.2 or B.3, after which the meaning TFCI values should be the same at both ends.
30 According to another embodiment, the party detecting the error communicates its TFCS and TFCI values to the other party, which takes the communicated values into use. According to a third embodiment, if a mobile communication means detects the error, it requests the network to send the TFCS and the TFCI values used by the network and if the network detects the error, it sends the TFCS and the TFCI values
35 used by the network preferably without waiting for the mobile communication means to request for the information.

In various examples of embodiments described in this specification, the transport formats have been classified as allowed or non-allowed. However, in some embodiments of the invention, a bearer having no allowed transport formats in a TFC can be assigned a null transport format, i.e. a transport format having a zero bit rate. Therefore, a null transport format corresponds to a non-allowed transport format. Therefore, in this specification and the accompanied claims the term allowed transport format refers to a non-null transport format, i.e. a transport format with an essentially nonzero bit rate, which can be used in the TFCS.

10 The present invention reduces the use of radio resources, while retaining flexibility in the use of different transport formats. The present invention allows restriction of the use of radio resources without making it impossible for some bearers to use high data rates. The flexibility of the inventive method allows such overall control of radio resources, while providing a way to specifically restrict certain specific services as well.

20 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

Claims

1. Method for controlling bearers in a cellular telecommunication system,
characterized in that the method comprises steps, in which
 - 5 - a set of allowed transport format combinations is constructed, and
 - information for construction of said set at a receiver is communicated to the receiver.
2. A method according to claim 1, characterized in that
 - 10 said set of allowed transport format combinations is constructed by checking for each transport format combination, whether the combination is within predefined limits.
3. A method according to claim 1, characterized in that
 - 15 a transport format combination identifier is assigned to each combination of said set of allowed transport format combinations.
4. A method according to claim 3, characterized in that
 - 20 said assigning of transport format combination identifiers is performed according to a predefined rule.
5. A method according to claim 4, characterized in that
 - 25 said set of allowed transport format combinations is ordered according to at least the total bit rate of the transport format combinations, and said transport format combination identifiers are assigned so that the identifiers form a sequence of consecutive integer numbers.
6. A method according to claim 1, characterized in that
 - 30 said step of communicating information for construction of said set comprises the step of communicating of each allowed transport format combination to said receiver.
7. A method according to claim 1, characterized in that
 - 35 said step of communicating information for construction of said set comprises the step of communicating of each non-allowed transport format combination to said receiver.

8. A method according to claim 1, characterized in that said step of communicating information for construction of said set comprises the step of communicating at least one limit for construction of said set to said receiver.

5 9. A method according to claim 1, characterized in that said step of communicating information for construction of said set comprises the step of communicating information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination.

10

10. A method according to claim 1, characterized in that said step of communicating information for construction of said set comprises the step of specifying the differences between said set to a previous set of transport format combinations.

15

11. A method according to claim 1, characterized in that a bearer request is admitted, if at least one of the transport formats of the requested bearer is a part of an allowed transport format combination.

20 12. A method according to claim 3, characterized in that transport formats used in a transmission between a receiver and a transmitter are identified by sending a transport format combination identifier from the transmitter to the receiver.

25 13. A method according to claim 3, characterized in that if either party of the connection detects that the transport format combination identifiers of the receiver do not correspond to the transport format combination identifiers of the transmitter, the transport format combination identifiers are reconstructed at at least one party of the connection.

30

14. A method according to claim 13, characterized in that said step of reconstruction comprises the reconstruction of transport format combination identifiers at both parties of the connection according to a predefined rule.

35

15. A method according to claim 13, characterized in that in said step of reconstruction, one of the parties of the connection communicates its

transport format combination identifiers to the other party, which takes the communicated identifiers into use.

16. System for controlling bearers in a cellular telecommunication system

5 characterized in that the system comprises

- means for construction of a set of allowed transport format combinations in a network element of the cellular telecommunication system, and
- means for communication of a constructed set of allowed transport format combinations to a mobile communication means.

10

17. A system according to claim 16, characterized in that

said means for construction of a set of allowed transport format combinations comprises

- a memory element for storing a set of allowed transport format combinations,
- 15 - means for checking whether a single transport format combination is within predetermined limits, and
- means for adding a single transport format combination to said set of allowed transport format combinations stored in said memory element.

20

18. A system according to claim 16, characterized in that

said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises means for determining non-allowed transport format combinations.

25

19. A system according to claim 16, characterized in that the system further comprises means for storing a previously constructed second set of allowed transport format combinations,

and said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises

30 means for searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations.

20. A system according to claim 16, characterized in that the system further comprises means for assigning a transport format combination identifier to each
35 transport format combination stored in said memory element.

21. A system according to claim 16, characterized in that the system further comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission.

1 / 3

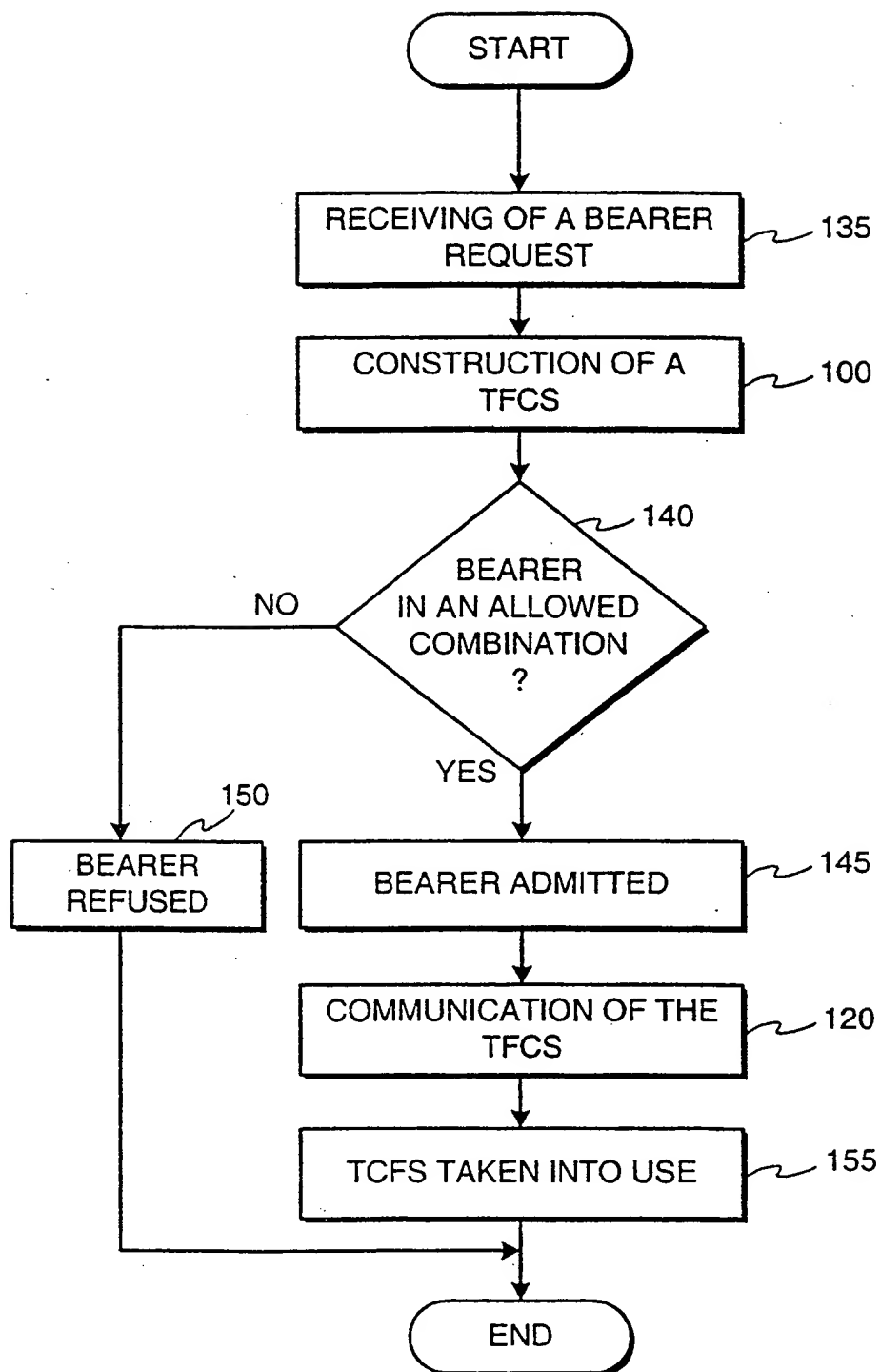


Fig. 1

2 / 3

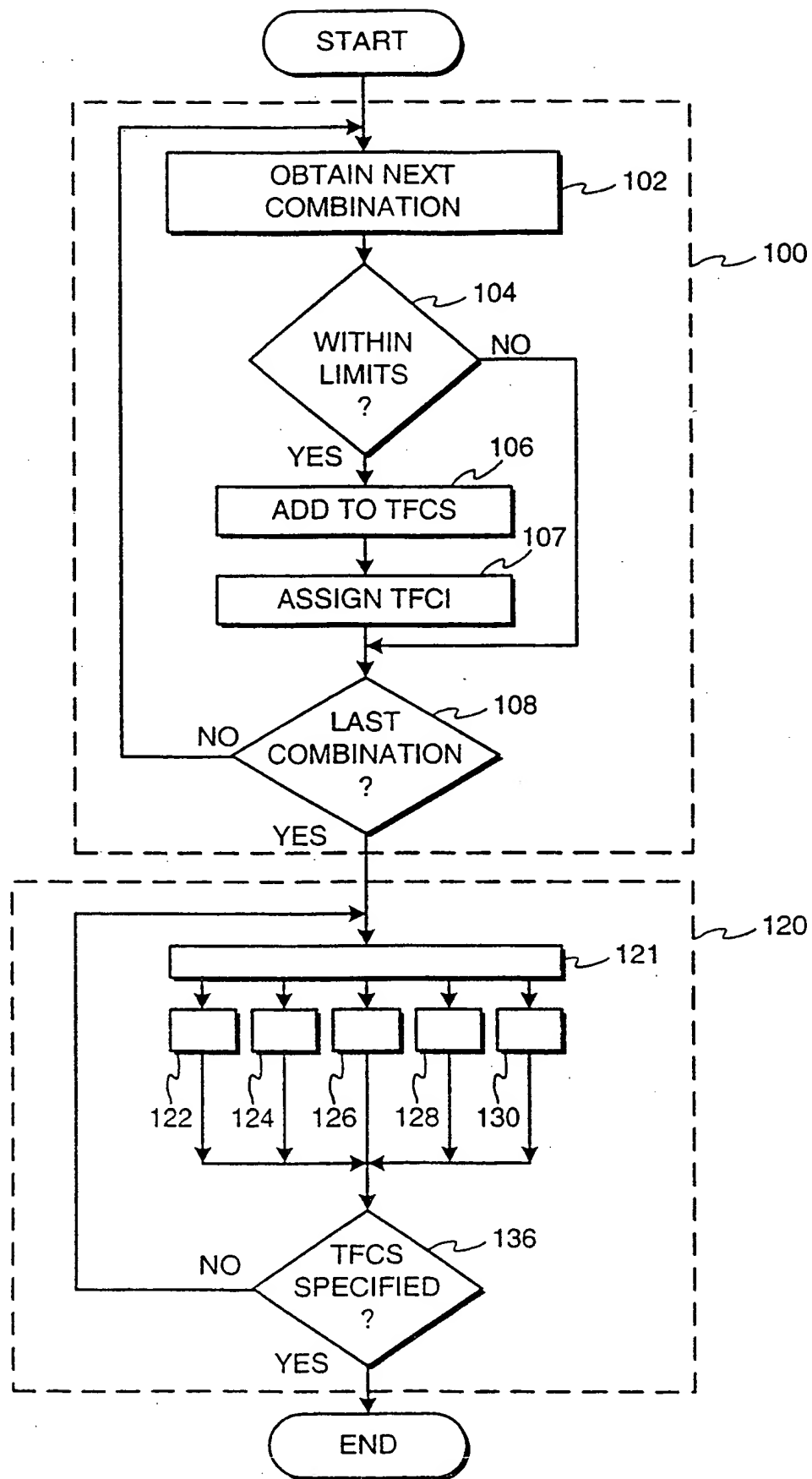


Fig. 2

3 / 3

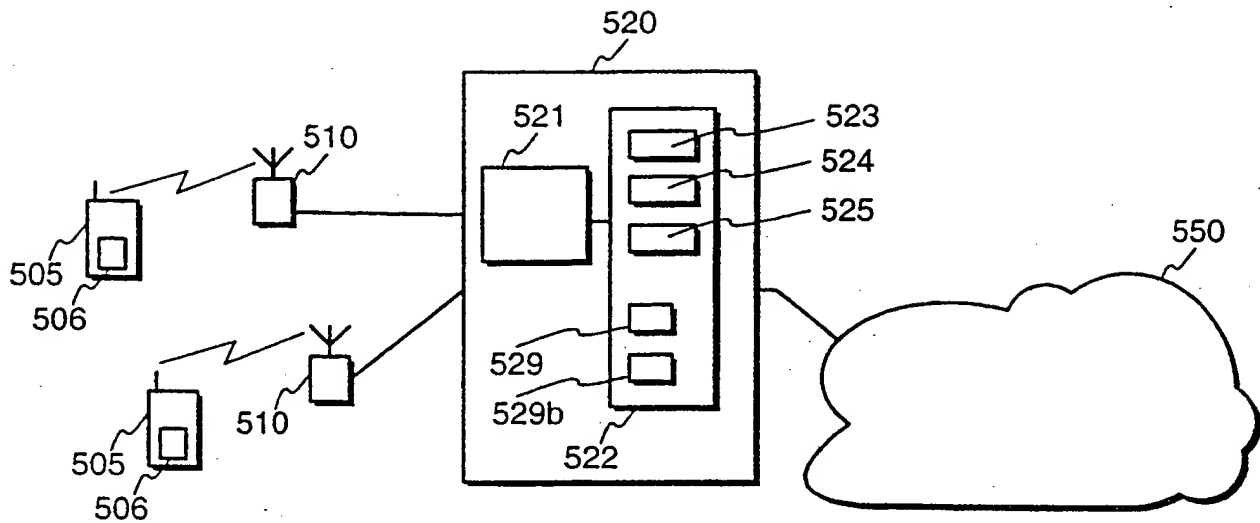


Fig. 3

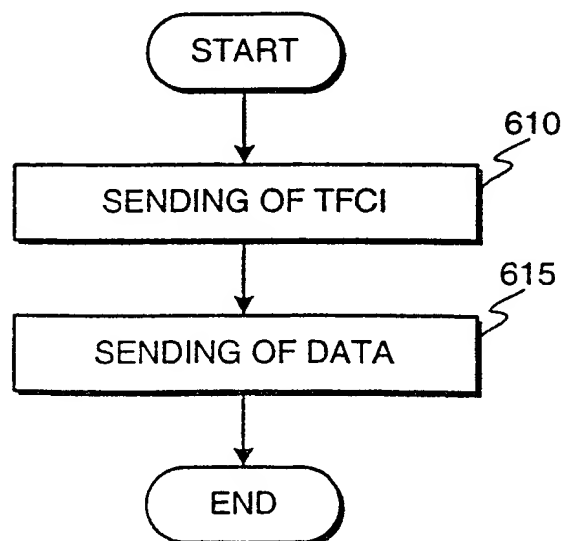


Fig. 4

Mobile communication system and method for establishing a data call

Field of the Invention

5 The present invention generally relates to mobile communication systems and particularly establishing data calls employing different data rates and bearer services.

Background of the Invention

10 In addition to conventional speech transfer, modern mobile communication systems provide their users with various kinds of data transfer features. The services provided by the mobile communication systems may generally be divided into Tele Services and Bearer Services. A bearer service is a telecommunication service which
15 constitutes the transfer of signals between the user-network interfaces. As an example of bearer services, modem services are mentioned. In a tele service, the networks also provides terminal equipment services. Examples of major tele services, in turn, include speech,
20 telefax, and videotext services.

 The bearer services are usually classified into groups, such as asynchronous and synchronous bearer services, according to a characteristic feature. In an asynchronous bearer service, the transmitting and
25 receiving data terminals only maintain their synchronization during each individual character to be transferred. In a synchronous bearer service, the transmitting and receiving data terminals are synchronized during the entire data transmission. Within each of such
30 groups there is group of bearer services, e.g. a transparent service and a non-transparent service. In a transparent service, the data to be transferred are unstructured, and the transmission errors will be corrected by using channel coding only. In a non-
35 transparent service, the data to be transferred are

structured into service data units, and transmission errors are corrected (in addition to channel coding) by using automatic requests for retransmission. In addition, each user data rate is presently an independent bearer service. Therefore, there will be a hugely increased number of different bearer services. For example, the single channel data services of the Pan-European digital mobile communication system GSM (Global System for Mobile Communication) now has 6 different asynchronous bearer services for the rates 300, 1200, 1200/75, 2400, 4800 and 9600 bit/s.

A mobile subscriber may typically be entitled to different kinds of tele and bearer services. He may, for example, have access to a speech service, telefax service and various kinds of data services that utilize bearer services. A mobile terminating or originating call may therefore require any of the aforementioned tele and bearer services, or combinations thereof, for which reason the correct service must be addressed to the mobile communication network. In the GSM mobile communication system, for example, call set-up signalling transmitted by a mobile station contains information on the required service in a specific BCIE (Bearer Capability Information Element). The mobile communication network may thus choose the appropriate service for the mobile originating calls. Calls originating from an ISDN (Integrated Services Digital Network) also contain a similar information element, indicative of the required service. If, however, the call originates from or is routed via the public switched telephone network (PSTN), information on the service type of the call will not be transmitted to the mobile communication network. In such a case, the mobile communication network should be informed in some other way what type of a basic service is required by the call. A prior art solution to the problem is represented by a

Multi Numbering Scheme in which a mobile subscriber has as many directory numbers as he has different services to which he wishes to receive incoming calls. In accordance with the multinumnering scheme, a calling subscriber dials the directory number of the mobile subscriber according to the desired service. In the GSM system, the services of the subscribers are determined in a subscriber's home location register (HLR), in which other subscriber information is also stored permanently. The HLR is also used for storing information on the mapping between the directory numbers and the services of the subscribers. In the HLR, a specific BCIE element indicating the type of a call and the network resources required for the call is also linked with the directory number (MSISDN).

For the network operator and the mobile subscribers, such a vast number of services causes confusion and trouble. In order for the mobile subscriber to be able to carry out data calls to applications of different rates, he must subscribe to several bearer services from the network operator. From the point of view of the network operator, it is in turn problematic that each user should require numerous directory numbers, which wastes the number space of the network. Furthermore, determining the services in the network databases consumes database capacity.

In the GSM network, for example, the problem is becoming more acute as the determining of high-rate HSCSD (High Speed Circuit Switched Data) data services, which employ multi-slot technique, increases the number of bearer services on top of the single-slot services already determined. Hence, it would be advantageous to both the network operators and the mobile subscribers if the number of different kinds of bearer services could be reduced.

A Disclosure of the Invention

It is object of the present invention to provide a

digital mobile communication network in which one determined bearer service can handle as many data rates as possible.

5 This object is obtained by a method of the invention for establishing a data call in a mobile communication system. The method is characterized by the steps of determining for a mobile subscriber at least one data call bearer service covering several user data rates,

10 carrying out, upon establishing the data call between the mobile communication network and the mobile station, a user data rate negotiation for setting the user data rate to be used in the data transfer between the mobile station and the mobile communication network,

15 allocating radio channel resources for the data call according to the user data rate negotiated,

continuing call set-up to the second party of the data call.

20 The invention further relates to a digital mobile communication system which is characterized by comprising at least one data call bearer service which covers several user data rates and which is determined for the mobile subscriber at the subscriber database of the mobile communication network,

25 a negotiation procedure between the mobile station and the mobile communication network, for negotiating during call set-up, a user data rate used in the data call for data transfer between the mobile station and the mobile communication network,

30 call control, allocating radio channel resources according to said negotiated user data rate.

35 The number of bearer services required in a mobile communication network can be significantly reduced by the method of the invention by determining a bearer service to cover several or all the user data rates, and by negotiating between the mobile station and the mobile

communication network, at the call set-up stage, the data rate to be employed by the data call in the bearer service. The next step is to determine the data rate between the mobile communication network and the fixed network, such as the PSTN or ISDN, i.e. the data rate of the second party in the data call. If required, the data rate of the mobile communication network and the channel resources of the radio path are then adapted to the data rate used in the direction towards the fixed network.

At the initial stage of call set-up, a negotiation on the user data rate takes place between the mobile station and the mobile communication network at the call set-up stage. The mobile communication network may consequently limit the call to employ such a data rate which it is able to support, by signalling a rate parameter in the BCIE at the call set-up stage. The mobile station and/or an application used in a data terminal equipment connected thereto may also limit the call to use a transfer rate it supports by signalling a similar rate parameter in the BCIE. The mobile subscriber can also limit the call to use a desired data rate by configuring the BCIE rate parameter via the user interface. Following this, the mobile communication network allocates the radio channel resources and the network adaptor the call desires, and establishes a connection to the fixed network.

At the next stage, the data rate between the mobile communication network and the fixed network is negotiated or identified. If the call is a modem call, the network adaptor allocated above is a data modem. In the invention, the network adaptor modem may, within the specific data rate limit, carry out a data rate handshaking with a fixed network data modem employing any data rate. This enables operation with applications of the fixed network that use different rates. Said rate limit means that the handshaken

data rate is to be limited to a level lower than or equalling the data rate negotiated by the mobile station and the mobile communication network at the first stage. As soon as the data rate handshaking has been completed,
5 the network adaptor modem informs of the data rate negotiated in the handshaking.

If the information is Unrestricted Digital Information (UDI) towards the ISDN network, the data rate employed towards the fixed network is recognized either
10 from the traffic channel itself, ISDN signalling, or in any other suitable manner.

At the third stage of the call set-up procedure according to the invention, the data rate of the mobile communication network and the radio path channel
15 resources, allocated at the first stage, are if need be adapted to the data rate used by the fixed network and handshaken or recognized at the second stage. If the handshaken or recognized user data rate is higher than the rate negotiated by the mobile station and the mobile
20 communication network at the first stage, the call is released in the case of a transparent data call. If the data rate handshaken or recognized at the second stage is lower than the transfer capacity of channel resources allocated on the radio path at the first stage, surplus
25 capacity is released and/or channel coding is changed for a better one, if possible. If the data rate handshaken or recognized at the second phase is as high as the rate agreed upon at the first stage, the channel resources of the radio path are maintained unchanged.

30 The present invention enables significant reduction in the number of bearer services. It is possible to determine, e.g., one asynchronous bearer service which can be used in initiating all asynchronous data calls regardless of whether the call is terminated as
35 transparent or non-transparent or which the final data

rate will be after the call set-up according to the invention. This means that only one directory number, and a matching BCIE, has to be allocated for the subscriber for an asynchronous bearer service (compared to six numbers presently). This, in turn, results in a corresponding saving of database capacity and network number space. In addition, it facilitates making mobile-terminating calls particularly, because the calling subscriber only needs to know one asynchronous data service number. In the same manner it is possible to bring other, previously separate bearer services under one bearer service or service class for example so that all asynchronous data services constitute a bearer service, PAD access constitutes a bearer service, and Packet access constitutes a bearer service.

Brief Description of the Drawings

In the following, the invention will be described by means of the preferred embodiments, with reference to the accompanying drawings, in which

Figure 1 illustrates a part of a mobile communication network in which the present invention may be applied,

Figure 2 shows a schematic block diagram of a mobile services switching center with an associated network adaptor equipment IWF,

Figure 3 is a signalling chart illustrating a mobile-originating modem call,

Figure 4 is a signalling chart illustrating a mobile-originating UDI call, and

Figure 5 is a signalling chart illustrating a mobile-terminating modem or UDI call.

The Preferred Embodiments of the Invention

The present invention can be used in all digital mobile communication systems that support several different types of data services having different data

rates.

The present invention is particularly well suited for data transfer applications in the Pan-European digital mobile communication system GSM (Global System for Mobile Communications) and other GSM-based systems, such as DCS1800 (Digital Communication System), and the digital cellular system PCS (Personal Communication System) in the USA. The structure and operation of the GSM system are well known by a person skilled in the art, and they are specified in the ETSI (European Telecommunications Standards Institute) GSM specifications. Reference is also made to "GSM System for Mobile Communication" by M. Mouly and M. Pautet, Palaiseau, France, 1992; ISBN 2-9507190-0-7.

The basic structure of the GSM system is illustrated by Figure 1. The GSM structure consists of two parts: a base station system BSS and a network sub-system (NSS). The BSS and the mobile stations MS communicate over radio connections. In the BSS, each cell is served by a base station BTS. A group of base stations is connected to a base station controller BSC, whose purpose is to control the radio frequencies and channels used by the BTS. The BSCs are connected to a mobile services switching center MSC. Specific MSCs are connected to other telecommunication networks, such as the PSTN, and comprise gateway functions for calls to and from these networks. These MSCs are known as gateway MSCs (GMSC).

There are two main classes of databases, associated with routing the calls. A home location register HLR permanently or semi-permanently stores the subscriber data of all the subscribers of the network, including information on the services the subscriber may have access to, and on the subscriber's current location. The second register type is a visitor location register VLR. The VLR is usually associated with one MSC, but it may, however,

serve several MSCs. It is common practice that the VLR is integrated into the MSC. The integrated network element is known as a visitor MSC (VMSC). Whenever the mobile station MS is active (registered and capable of making or receiving calls), the majority of the mobile subscriber information concerning the MS and stored in the HLR is copied to the VLR of the particular MSC in whose service area the MS is located.

Still referring to Figure 1, a data link is established in the GSM system between a mobile station MS network terminal TAF (Terminal Adaptation Function) 31 and a network adaptor IWF (Interworking Function) 41 in the mobile communication network. In the GSM network, the data link in data transfer is a V.110 rate adapted, V.24 interface compatible, UDI coded digital Full Duplex connection. In this connection, the V.110 connection is originally a digital transmission channel developed for ISDN (Integrated Services Digital Network). The transmission channel adapts to the V.24 interface and also provides a possibility for transfer of V.24 statuses (control signals). The CCITT recommendation for a V.100 rate-adapted connection is specified in the recommendation CCITT Blue Book: V.110. The CCITT recommendation for a V.24 interface is disclosed in the CCITT Blue Book: V.24. The terminal adaptor TAF adapts a data terminal DT connected to the MS for the V.110 connection which is established over a physical connection using one or more traffic channels. The network adaptor IWF couples the V.110 connection to another V.110 network such as an ISDN or another GSM network, or to another transit network, e.g. the public switched telephone network PSTN.

As disclosed above, modern mobile communication systems support different kinds of tele and bearer services. The bearer services of the GSM system are specified in the specification GSM 02.02 version 4.2.0,

and the tele services in the specification GSM 0.0.3 version 4.3.0.

The network adaptor IWF is often placed at the MSC. Figure 2 illustrates a network adaptor apparatus placed at the MSC, carrying out the adapting to the PSTN and the data services of the ISDN network. For adapting to the PSTN, an ISDN 3.1 kHz audio service or another GSM network, the IWF comprises a group of baseband data modems 41A, which also include a rate adaptor. The modems 41A are autobauding modems capable of handshaking any data rate supported by the GSM system between 300-9600 bit/s, or for HSCSD data services even higher transfer rates, for example 14.4-28.8 kbit/s. For reasons of clarity, Figure 2 only shows one modem 41A, but any required number of them may be used. The analog side of the modem 41A is connected via an exchange termination ET and the digital side is connected directly to a group switch GSW21 in the MSC. In addition, via the exchange termination ET, digital transfer links to the base stations system BSS are coupled to the group switch 21. Furthermore, via the exchange terminations ET, the transmissions channels of other telecommunication networks, such as ISDN or PSTN, are coupled to the group switch 21. The adaptor apparatus of Figure 2 further comprises, for adapting to the UDI, a data interface unit DIU 41B which contains a rate adaptor. The DIU is used in GSM calls to adapt the user data, rate adapted according to the V.110 recommendation, from the ISDN, as well as the status and control information according to the V.110 recommendation to the GSM traffic channel, and in the opposite direction, the user data from the GSM traffic channel as well as the status and control information to the V.110 frame structure of the ISDN. The ISDN side of the DIU 41B is connected via the exchange terminal ET, and the GSM side directly to the group switch GSW21. Although only one DIU 41B is shown in Figure 2,

there may be any number of them depending on capacity requirements. The group switch GSW21 and the network adaptor apparatus, as well as data call establishing, maintaining and releasing are all controlled by a call control 42. The operation of the IWF is controlled by an IWF controller 41C which, under control of the call control 42, connects a network adaptor, i.e. the modem 41A or DIU 41B, required by the bearer service used by a particular data call for the data connection. In Figure 2, a solid line illustrates connecting the modem 41A, and a broken line illustrates connecting the DIU 41B. As an example of a mobile services switching center comprising such a network adaptor apparatus, the Nokia Telecommunication Ltd DX200 MSC can be mentioned.

As noted above, a mobile subscriber may traditionally have been entitled to different tele and bearer services each having a separate directory number MSISDN. In other words, each subscriber has had several MSISDN numbers. In addition, it has been necessary to determine every tele and bearer service of every subscriber in the subscriber's HLR in connection with other subscriber data, and to transfer them to the VLR. In the subscriber data, every MSISDN number is associated with a GSM system BCIE value, either directly or by means of an index pointing to a BCIE values chart. The BCIE is an information element used by the GSM system to transfer information on all the network requirements related to the call, such as transfer rates, number of data and end bits, etc. The BCIE is described in, for example, the GSM specification 04.08, version 4.5.0, pp. 423-431.

So far, every data rate has made up an individual bearer service. In the present invention, it is no longer necessary to determine every data rate required by the user as a bearer service in the subscriber data, but it is sufficient to determine only a few bearer service

categories within which the subscriber has access to all the data rates supported by the GSM network. Accordingly, the bearer services in the subscriber data may be classified, for example, the following way: asynchronous services, synchronous services, PAD access and Packet access.

This is feasible by means of the tree-stage call set-up procedure according to the invention. At the first stage, the data rate is negotiated between the MS and the GSM network; at the second stage, the data rate to be used between the GSM network and the fixed network, such as PSTN or ISDN, is negotiated or recognized; and at the third stage, the channel type and/or channel coding to be used on the radio path (in a HSCSD service, also the number of radio channels required) are, if necessary, adapted to the final transfer rate employed by the call.

The following will describe the call set-up of the invention in the cases of a mobile-originating (MO) modem call, a mobile-originating UDI call, and a mobile-terminating (MT) call with reference to Figures 3, 4 and, correspondingly, 5.

An MO modem call

With reference to Figure 3, the MS initiates call set-up in an MO modem call by transmitting a CALL SETUP message, containing the BCIE element, to the MSC. The parameters of the BCIE indicate the service and the user data rate desired. Typically, the BCIE rate parameter is set by the MS, or the application used by a terminal equipment DTE connected to the MS, to a data rate it supports. It is also possible that the MS user limits the data call to a rate he desires by configuring the BCIE rate parameter through an MS user interface. The user may choose this course of action if, for example, he is aware that he is making a call to a slow-rate PSTN service, or if he knows that for his particular purpose a slow-rate

service is more economical than a high-rate service.

Having received the CALL SETUP message, the MSC/VLR carries out a compatibility check and a Subscription check. In the latter, the MSC/VLR checks from the subscriber data whether the mobile subscriber is entitled to the service requested in the BCIE. In the compatibility check, the MSC checks whether it is able to support the service requested. If the MSC does not support the data rate requested by the MS due to its too high a level, the MSC reduces the data rate to a value it supports. If the MSC supports the data rate requested by the MS, it keeps the data rate at the same level. Following this, the MSC sends to the MS a CALL PROCEEDING message which indicates to the MS that the call is proceeding. This message also contains a BCIE element wherein a rate parameter is indicative of the data rate chosen by the MSC. In step 2, the MS checks the data rate indicated by the MSC. If the possibly altered data rate is not accepted by the MS, it may release the call. If the MS accepts the data rate, it configures itself for this data rate.

Following this, the MSC reserves a terrestrial connection and requests the BSS to allocate a required radio channel (channels) by an ASSIGNMENT REQUEST message. This message includes information on the resources required. The BSS allocates the radio channel, and if the MS tunes onto that channel, the BSS sends an acknowledgement to the MSC in an ASSIGNMENT COMPLETE message. Then, the MSC allocates required resources from the network adaptor IWF by transmitting an IWF SETUP message. The IWF acknowledges the procedure with an ACKNOWLEDGEMENT message. In Figure 2, allocating the IWF resources according to Figure 3 (step 4) means that the call control 42 commands the IWF controller 41C to reserve the modem 41A.

Subsequently, the MSC initiates connection set-up

to the called PSTN subscriber with an INITIAL ADDRESS message. The called PSTN subscriber connects his modem to the line and replies with an ANSWER SIGNAL message. The MSC directs the IWF modem onto the line with a MODEM ON LINE message (step 6). In Figure 2 MSC this means that the
5 call control 42 connects, by means of the GSW 21, the modem 41A between the transmission line from the BSS and the transmission line to the PSTN, as illustrated in Figure 2. Following this, the GSM traffic channel becomes
10 synchronized between TAF and IWF, and the IWF modem 41A begins handshaking on the data rate with the modem of the called PSTN subscriber. As noted regarding Figure 2, the IWF modem 41A is able to handshake, within the rate limits, with a PSTN modem supporting any data rate. By
15 means of the handshaking, it is possible to negotiate any data rate supported by the PSTN modem to be the data rate between the IWF modem 41A and the PSTN modem. In this manner, data calls to the fixed network applications that use different rates are made possible within the framework
20 of one bearer service. Upon completion of the handshaking, the IWF modem 41A informs the IWF controller 41C of the handshaken data rate (step 8). If the handshaken rate is high enough, i.e. the same as the rate negotiated by the MS and the MSC, the IWF controller 41C directs the modem
25 41A to signal with traffic channel V.24 status (CT106, CT109) to the MS that the traffic channel is ready for data transfer (step 9). This is proceeded by a data transfer step 10.

If, however, the IWF controller 41C detects at step
30 8 that the data rate handshaken by the modems is too low compared to the channel resources allocated on the radio path according to the rate negotiated by the MS and the MSC, the IWF controller 41C requests a change to the number and/or type of channel from the MSC (call control
35 42). The above may comprise changing the channel coding

into a more efficient one by applying a channel mode modify procedure, changing the channel type from a full-rate channel to a half-rate channel, or by reducing the number of traffic channels allocated for the connection (in a multi-slot transfer). This is illustrated by the messages CHANNEL NUMBER MODIFY and CHANNEL MODE MODIFY, and an acknowledgement message thereto, ACKNOWLEDGE. Step 12 illustrates how the BSS releases superfluous channels, and the MS and the BSS alter the channel coding of the channels remaining in use suitable for the data rate. Step 13 exemplifies a case wherein, in case the user data rate remains lower than the transfer capacity of the number of channels required, the TAF and the IWF rate-adapt, according to the GSM specifications, the user data rate for the traffic channel capacity in use. Following this, the GSM traffic channel synchronizes, and the TAF and the IWF signal with the traffic channel V.24 statuses that the traffic channel is ready for data transfer, step 14. This is proceeded by the data transfer stage.

20 Mobile-originating (MO) UDI call

The following will describe, with reference to Figure 4, an MO type UDI call to the ISDN. Up to the answer signal message transmitted by the terminal equipment of the ISDN subscriber, and to step 5, the beginning of the call set-up in Figure 4 occurs as described above with reference to Figure 3. Following this, the MSC connects the required IWF resources by transmitting a "device on line" message to the network adaptor IWF. In the MSC of Figure 2, this means that the call control 42 commands the IWF controller 416 to connect the DIU unit 41B, allocated above in step 4, onto the line. Consequently, the DIU is connected, via the group switch 21, between the transmission line from the BSS and the transmission line to the ISDN network, as illustrated by the broken line in Figure 2. Following this, the GSM

traffic channel will be synchronized between TAF - IWF, and the ISDN traffic channel will be synchronized between the IWF and the ISDN terminal equipment. Then, rate recognition of the ISDN traffic channel will be carried out according to the invention at step 8. If ISDN signalling is employed in which the BCIE element indicative of the user data rate is transferred, no other rate recognition will be required. According to the preferred embodiment of the invention, the transfer rate of an ISDN traffic channel is recognized by means of the IWF from the traffic channel itself. The data rate used is recognized from the octet bit use at the synchronization stage of the ISDN traffic channel. This means that the synchronization zeros (0) according to the recommendation ITU-T V.110 are noticeable in the used bits of the octet, while other bits in each octet are ones (1). According to the ITU-T V.110 recommendation, the data rate used by ISDN synchronous bearer services is coded in the E1, E2 and E3 bits of the V.110 frame used in the data transfer. The user data rate of asynchronous ISDN bearer services, in turn, can be found out from the ISDN traffic channel by the IWF monitoring the exchange of parameters by the terminal equipments, described in the ITU-T V.110 recommendation in the Appendix I, Inband Parameter Exchange, IPE. Recognition of a data rate of a traffic channel of an application or a telecommunication network which is external to the GSM network, when interconnection is implemented by direct and/or dedicated non-standardized interfaces, may take place by other than the aforementioned methods. As far as the invention is concerned, it is only essential that the data rate used in the UDI call is recognized. As soon as the IWF UDI 41B has recognized the data rate on the ISDN traffic channel, it informs the IWF controller 41C of the rate. After that, the call set-up of Figure 4 proceeds the same way as in

Figure 3 except that instead of the data rate handshaken by the modems, the recognized data rate mentioned above is now examined.

Mobile-terminating (MD) data call

5 In the following, with reference to Figure 5, a mobile-terminating modem or UDI call will be described. The gateway MSC, GMSC, receives a call addressed to a directory number MSISDN of a GSM mobile subscriber. The GMSC requests routing information from the HLR by a "send
10 routing info" message. The HLR retrieves from its database service information, i.e. the BCIE element, corresponding with the MSISDN. For example, it is assumed that an asynchronous 3.1 kHz bearer service is in question, covering in accordance with the invention all the data
15 rates. After this, the HLR requests a roaming number from the VLR where, according to the subscriber data, the mobile subscriber is currently located. The same request message also transfers the BCIE element. The VLR stores the BCIE element and allocates a roaming number MSRN for
20 the call. The MSRN is transmitted to the HLR which forwards it to the GMSC. On the basis of the roaming number, the GMSC routes the call to the MSC under control of which the mobile subscriber is located. In step 3, the MSC requests call set-up information from the VLR on the
25 basis of the MSRN. On the basis of the MSRN, the VLR retrieves the BCIE which was previously received from the HLR, and transmits it to the MSC. At this stage, the MSC checks whether it supports the bearer service requested. If it does, it chooses the highest data rate it supports
30 for the bearer service. The chosen user data rate is inserted as the value of the BCIE rate parameter in a call set-up message "setup" which is transmitted to the MS. In step 4, the MS checks whether it supports the bearer service requested and the chosen user data rate. If it
35 does, it accepts the request as such. If the user rate is

too high for the MS, it reduces the user rate to a level it supports. Then, the MS sets the user data rate it desires as the value of the rate parameter in the BCIE which is transmitted to the MSC in an acknowledgement message "call confirm". Following this, the MSC requests the BSS to allocate radio channels required with an "assignment request" message, and the BSS acknowledges with an "assignment complete" message. After this, the MSC allocates IWF resources required with a "setup" message, and the IWF acknowledges with an "acknowledgement" message. This is entirely identical with allocating IWF resources in Figures 3 and 4. The MS notifies with an "alerting" message that alerting of the called subscriber has been commenced. The MSC, in turn, uses an "address complete" message to inform the calling subscriber in the PSTN/ISDN network that the connection has been established. The MS then transmits a "connect" message indicative of the called subscriber accepting the call, which results in that the MSC transmits an "answer signal" message to the calling PSTN/ISDN subscriber. Following this, the modem or the rate adaptation is connected to the line, and call set-up is continued as in Figures 3 or 4 depending on whether the call is a modem call from the PSTN network or a UDI call from the ISDN network.

The following will deal with examples of a data call set-up in different call situations.

Example 1: an MO modem call, transparent, the PSTN determining the rate. The MS initiates a data call by signalling in the set-up message BCIE the parameters: user rate = 28.8, CE = transparent, ITC = 3.1 kHz, modem type = autobauding. The MSC detects that it supports the service requested and that the subscriber is entitled to the bearer service requested. The MSC allocates the IWF resources and establishes a connection to the PSTN. A

required number of radio channels will be allocated for the call; the user rate of 28.8 kbit/s requires three 9.6 kbit/s subchannels. The MSC configures the IWF modem into autobauding mode with 28.8 kbit/s as the maximum rate, without error correction protocol. The IWF modem and the PSTN modem handshake for the rate 14.4 kbit/s, e.g. because the PSTN modem does not support any higher rates. The IWF takes into account the handshake result of the modems and informs the MSC of the new user rate 14.4 kbit/s. The MSC requests the BSS to reduce the number of subchannels used by the call into two, whereby the BSS releases one subchannel. The MS TAF and the IWF adapt the 14.4 kbit/s user rate into two 9.6 kbit/s subchannels.

Example 2: An MO modem call, transparent, the PSTN determining the rate. The MS signals in the set-up message BCIE the parameters: user rate = 9.6, CE = transparent, ITC=3.1 kHz, modem type = autobauding. The MSC detects that it supports the bearer service requested and that the subscriber is entitled to the bearer service requested. The MS allocates the IWF resources and establishes a connection to the PSTN. One 9.6 kbit/s channel will be allocated for the call. The MSC configures the IWF modem into autobauding mode with 9.6 kbit/s as the maximum rate, without error correction protocol. The IWF modem and the PSTN modem handshake for the rate 4.8 kbit/s. The IWF takes into account the handshake result of the modems and informs the MSC of the new user rate of 4.8 kbit/s, and requests that the channel coding be made more efficient by a CMM procedure (Channel Mode Modify), or that the channel type be changed from a full-rate channel to a half-rate channel. In accordance with the GSM specifications, the IWF and the MS TAF adapt the 4.8 kbit/s user rate into the available traffic channel.

Example 3: An MO modem call, transparent, the MSC determining the rate. The MS signals in the setup message

BCIE the parameters: user rate = 28.8, CE = transparent, ITC = 3.1 kHz, modem type = autobauding. The MSC detects that it supports the 3.1 kHz bearer service only at the rate 9.6 kbit/s, or lower. The MSC further detects that the subscriber is entitled to the bearer service requested. The MSC thereby signals a new rate of 9.6 kbit/s to the MS with the BCIE rate parameter of the call proceeding message. The MS accepts the new rate or releases the call. Then, the MSC allocates the IWF resources and establishes a connection to the PSTN. One 9.6 kbit/s GSM traffic channel will be allocated for the call. The MSC configures the modem into autobauding mode with 9.6 kbit/s as the maximum rate, without the error correction protocol. The IWF modem and the PSTN modem handshake onto the same rate of 9.6 kbit/s, after which the IWF and the MSTAF transfer data at the user rate of 9.6 kbit/s.

Example 4. An MO UDI call, transparent, the ISDN determining the rate. The MS signals in the setup message BCIE the parameters: user rate = 28.8, CE = transparent, ITC = UDI. The MSC detects that it supports the bearer service requested and that the subscriber is entitled to the bearer service requested. The MSC allocates the IWF resources and establishes a connection to the ISDN. A required number of radio channels, i.e. three 9.6 kbit subchannels are allocated for the call. The MSC configures the IWF rate adaptor DIU with 28.8 kbit/s as the maximum rate. Following this, the IWF detects, by any of the above ways, that the ISDN terminal equipment uses a different data rate, e.g. 19.2 kbit/s, and signals the new user rate of 19.2 kbit/s to the MSC. The MSC requests the BSS to reduce the number of GSM subchannels allocated for the call into two, whereby the BSS releases one GSM traffic channel. The IWF and the TAF adapt the 19.2 kbit/s user rate into two 9.6 kbit/s subchannels.

Example 5: An MO UDI call, transparent, the MSC determining the rate. The MS signals in the setup message BCIE the parameters: user rate = 28.8, CE = transparent, ITC = UDI. The MSC detects that the subscriber is entitled to the bearer service requested, but the MSC itself only supports UDI bearer services at 9.6 kbit/s or lower rates itself. The MSC signals a new rate of 9.6 kbit/s to the MS in the "call proceeding" message BCIE. The MS accepts the new rate or releases the call. The MSC allocates the IWF resources and establishes a connection to the ISDN. If ISDN signalling support is available, the user rate of 9.6 kbit/s will be signalled to the ISDN. One 9.6 kbit/s GSM traffic channel will be allocated for the call. The MSC configures the IWF rate adaptor DIU with 9.6 kbit/s as the maximum rate. The IWF and the ISDN terminal equipment synchronize onto the rate 9.6 kbit/s. If ISDN signalling support is not available, the terminal equipments may negotiate a new rate using an in-band negotiation according to the recommendation V.110. The TAF and the IWF transfer data at the user rate of 9.6 kbit/s.

Example 6: An MT modem call, transparent, the PSTN/ISDN determining the rate. The MSC/VLR receives, either from the HLR or the PSTN/ISDN, a BCIE element comprising the setup parameters: user rate = 28.8, ITC = 3.1 kHz. The MSC detects that the subscriber is entitled to the bearer service requested. The MSC defines the BCIE parameters of the setup message to be transmitted to the MS as follows: modem type = autobauding, CE = Both NT, if the MSC supports both the transparent and the non-transparent data call. The MS specifies in the response message "call confirm" whether the call will be transparent or non-transparent by setting the BCIE parameter CE = T or CE = NT. In this example, a transparent connection CE = T is established. The MSC allocates the IWF resources and establishes a connection

to the PSTN/ISDN. After that, the call set-up procedure proceeds as in Example 1 after the PSTN connection set-up.

Example 7: An MT modem call, transparent, the MSC determining the rate. The MS receives, as in the example above, the BCIE setup parameters: user rate = 28.8, ITC = 3.1 kHz. The MSC detects that the subscriber is entitled to the bearer service requested, but the MSC itself only supports 3.1 kHz bearer services at 9.6 kbit/s or lower rates. The VMSC sets the BCIE parameters of the setup message transmitted to the MS as follows: modem type = autobauding, CE = both NT, if the VMSC supports both the transparent and the non-transparent data service, and user rate = 9.6 kbit/s. The MS specifies that the call will be transparent by setting the BCIE parameter CE = T in the call confirm message. The MSC allocates the IWF resources and establishes a connection to the PSTN/ISDN, after which call set-up will continue as in Figure 2.

If the MS does not support in the data call as high a data rate as the MSC is requesting, the MS may change the user data parameter to a desired value in the "call confirm" message BCIE. The MSC in such a case will attempt a call set-up towards the fixed network at a rate determined by the MS.

Example 8: In a call which will finally result in a non-transparent call, the fixed network leg of the connection and the GSM network leg do not necessarily have to have equal data rates. Therefore, as far as the present invention is concerned, it is sufficient that the rate negotiation between the MS and MSC is accepted. From the point of view of saving radio channels it is, however, advantageous that radio channel resources not required are also released in a non-transparent call in case the rate offered by the fixed network is clearly below the user rate requested. The following is an exemplary case of a transparent MO modem call in which the PSTN determines the

rate. The MS signals in the BCIE of the setup message the parameters: user rate 28.8, CE = both NT, ITC = 3.1 kHz, modem type = autobauding. The MSC detects that it supports the service requested and that the subscriber is entitled to the bearer service requested. The MSC specifies the call to be non-transparent, allocates the IWF resources and establishes a connection to the PSTN. Required number of radio channels, i.e. three GSM subchannels, are allocated for the call. The MSC configures the IWF modem into autobauding mode in which the use of error correction and compression protocol is allowed. The IWF modem and the PSTN modem handshake at the rate of 14.4 kbit/s without the compression protocol. The IWF takes into account the result handshaken by the modems, and informs the MSC of the new user rate of 14.4 kbit/s. The MSC requests the BSS to reduce the number of subchannels reserved by the data call from three into two, whereby the BSS releases a GSM traffic channel. The TAF and the IWF adapt the 14.4 kbit/s user rate into two 9.6 kbit/s subchannels by using the radio link protocol (RTP).

It should also be noted that in all the exemplary cases the MSC may signal the new user rate employed by the fixed network to the MS which may, if it desires, to release the call.

The Figures and the description related thereto are only intended to illustrate the present invention. The present invention may vary in details within the scope of the attached claims.

Claims

1. A method for establishing a data call in a mobile communication system, characterized by
5 determining for a mobile subscriber at least one data call bearer service covering several user data rates, carrying out, upon establishing the data call between the mobile communication network and the mobile station, a user data rate negotiation for setting the user
10 data rate to be used in the data transfer between the mobile station and the mobile communication network, allocating radio channel resources for the data call according to the user data rate negotiated, continuing call set-up to the second party of the
15 data call.
2. A method as claimed in claim 1, characterized by
determining the user data rate of the second party
in the data call,
20 allowing for the second party in a transparent call the user rate which is lower than or equal to said negotiated user rate,
changing in a transparent call the negotiated data rate between the mobile station and the mobile
25 communication network to match the user rate of the second party in case the user rate of the second party is lower than said negotiated user rate.
3. A method as claimed in claim 1, characterized by
30 determining the user rate of the second party in the data call,
adapting radio channel resources allocated on the basis of said negotiated user rate at the beginning of the call set-up, according to the user rate of the second
35 party.

4. A method as claimed in claim 3, characterized in that said adapting of the radio channel configuration comprises at least one of the following steps:

5 reducing the number of traffic channels allocated for the call,

 changing the channel coding, or
 changing the channel type.

10 5. A method as claimed in claim 1, characterized in that

 the negotiation between the mobile station and the mobile communication network comprises a further step of agreeing whether the data call will be transparent or non-transparent.

15 6. A method as claimed in claim 1, 2, 3, 4 or 5, characterized by

 defining, for the mobile subscriber, at least one of the following data call bearer services, each covering several user rates: an asynchronous bearer service, a
20 synchronous bearer service, a PAD access bearer service, or a Packet access bearer service.

7. A digital mobile communication system, characterized by comprising

25 at least one data call bearer service which covers several user data rates and which is determined for the mobile subscriber at the subscriber database of the mobile communication network,

30 a negotiation procedure between the mobile station and the mobile communication network, for negotiating during call set-up, a user data rate used in the data call for data transfer between the mobile station and the mobile communication network,

 call control, allocating radio channel resources according to said negotiated user data rate.

35 8. A mobile communication system as claimed in

claim 6, characterized in that the system comprises means for defining the user rate of the second party in the data call, and that the call control is arranged, in response to the second party having a lower
5 user rate than said negotiated user rate, to alter the user rate negotiated between the mobile station and the mobile communication network to match the user rate of the second party.

9. A mobile communication system as claimed in
10 claim 8, characterized in that the call control is arranged to adapt the data call radio channel configuration, allocated on the basis of said negotiated user rate at the beginning of the call set-up, according to the user rate of the second party.

15 10. A mobile communication system as claimed in claim 9, characterized in that said adapting of the radio channel configuration comprises at least one of the following operations: reducing the number of traffic channels allocated for the call, changing the
20 channel coding or channel type.

11. A mobile communication system as claimed in claim 7, characterized in that
in the negotiation procedure between the mobile station and the mobile communication network, it is also
25 agreed whether the data call will be transparent or non-transparent.

30

35

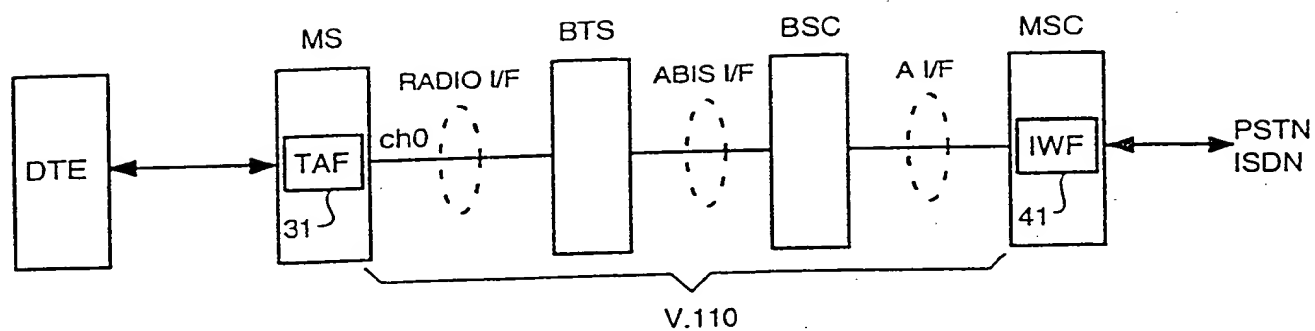


Fig. 1

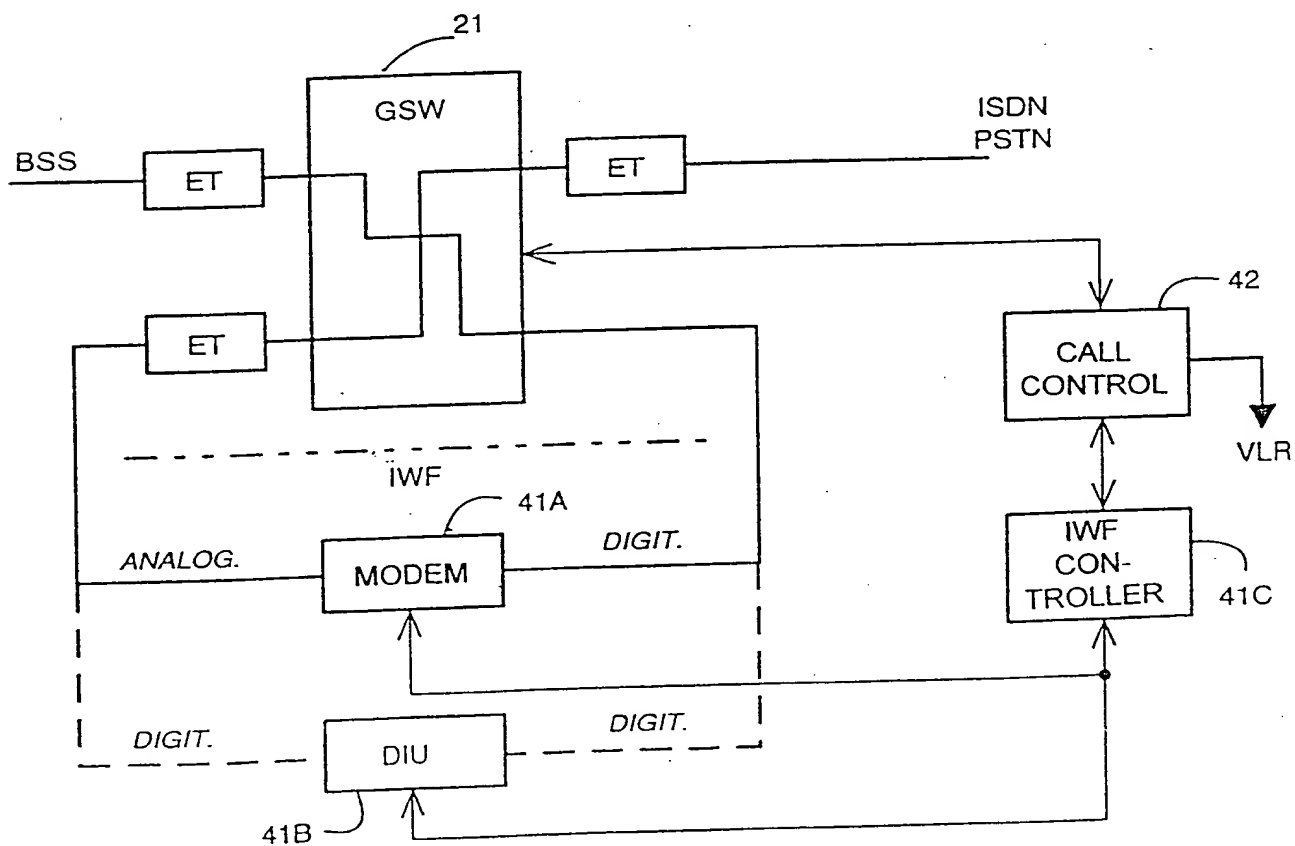


Fig. 2

2/4

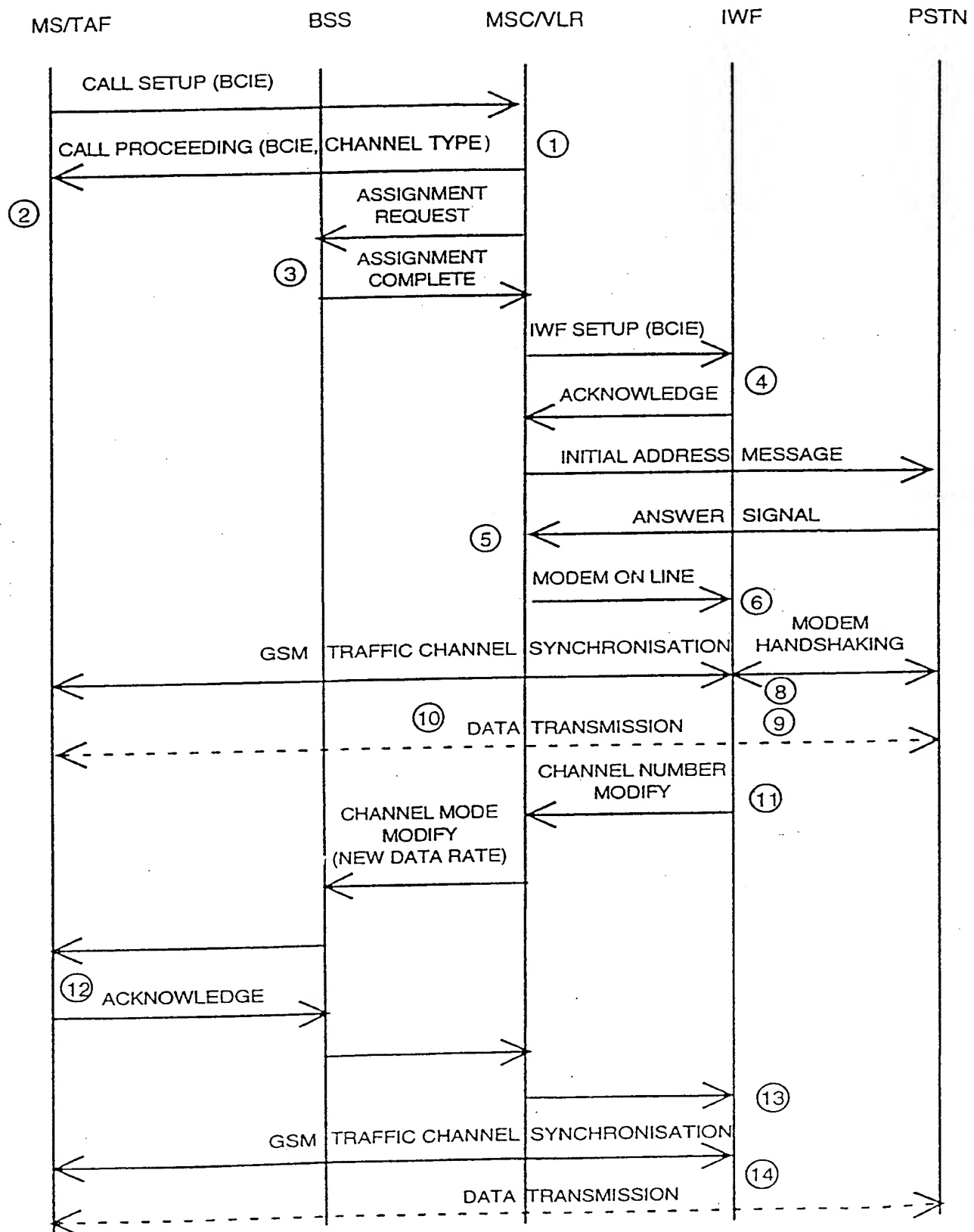


Fig. 3

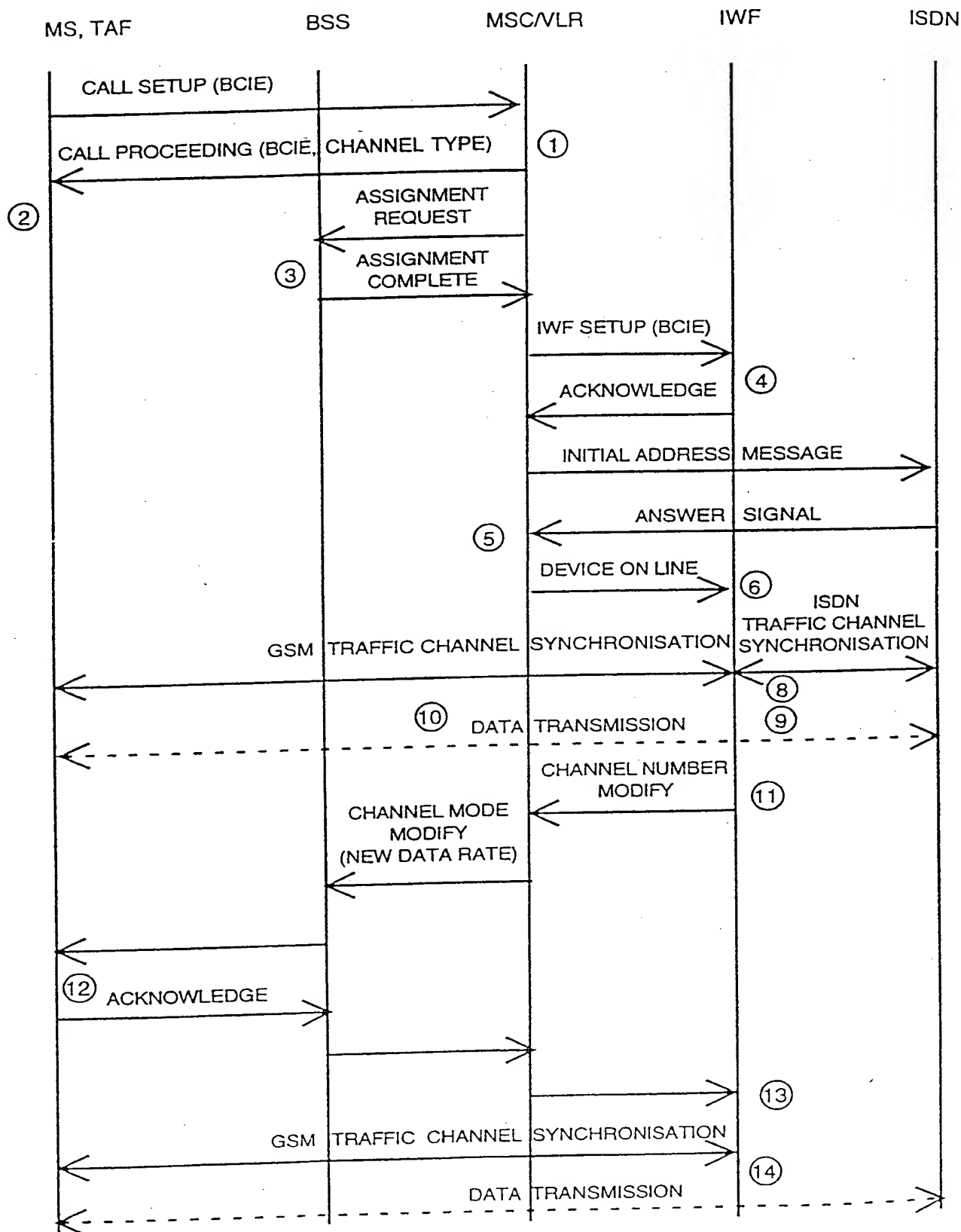


Fig. 4

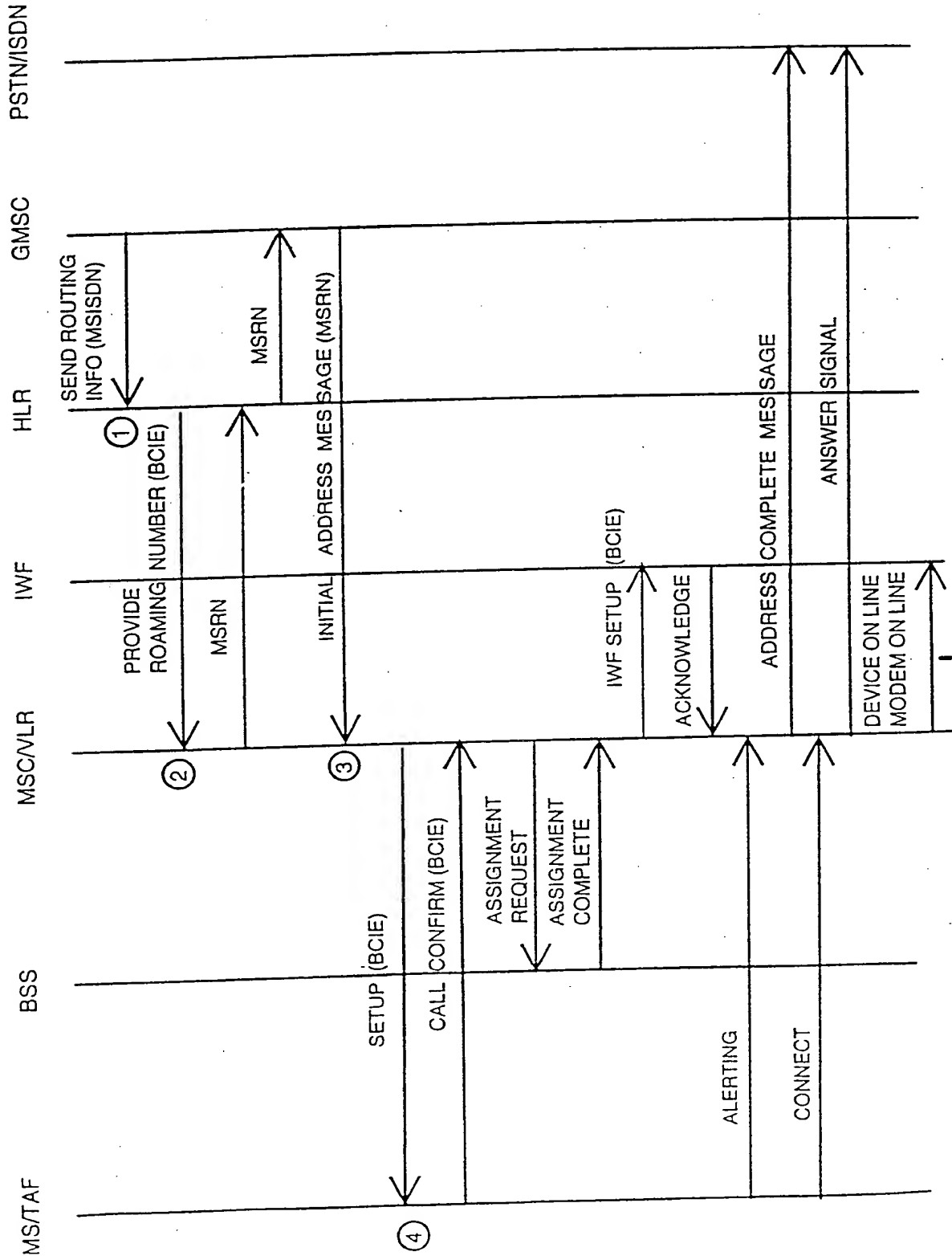


Fig. 5

AS IN FIGS. 3 & 4